National Transportation Safety Board

Office of Railroad, Pipeline and Hazardous Materials Investigations
Human Performance and Survival Factors Division
Washington, DC. 20594

Survival Factors[1] Factual Report

June 6, 2008

Failure of Dixie Pipeline Company Pressurized Underground Transmission Pipeline, and Subsequent Liquid Propane Release and Fire, near Carmichael, MS, on November 1, 2007

NTSB Accident Number: DCA 08 MP 001

Compiled by: // s // Date June 6, 2008
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Supervisory review: // s // Date June 6, 2008
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[1] The scope of the Survival Factors Factual Report [in pipeline accident investigations] exclusively addresses the emergency preparedness and response, and injury causation aspects of the investigation.

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Note – Photographs compiled during the investigation by the Survival Factors Working Group will be forthcoming in a separate Addendum to the Survival Factors Factual Report.

Select Acronym Nomenclature / Abbreviations used in this report

~	approximately
BP	barometric pressure
°C	degrees Centigrade [ambient temperature]
CD	compact disk (digital document)
CO	carbon monoxide [air quality component]
CST	Central Standard Time
cfs	cubic feet per second
CVFD	Carmichael Volunteer Fire Department
Dixie	Dixie Pipeline Company
DP	dew point [temperature]
EMS	Emergency Medical Services
EOC	Emergency Operations Center
°F	degrees Fahrenheit [ambient temperature]
H_2S	hydrogen sulfide [air quality component]
HCA	High Consequence Area
hrs	hours
ICS	Incident Command System (see also NIMS)
in. Hg	inches of mercury [barometric pressure]
kts	knots [wind speed]
lb	pounds [weight]
LEL	lower explosive limit
mi	mile (statutory)
MP	milepost [pipeline]
mph	miles per hour
MSDEQ	Mississippi Department for Environmental Quality
MSEM	Mississippi Division of Emergency Management
NFPA	National Fire Protection Association[2]
NIMS	National Incident Management System (for specific detail, see [Internet] http://www.dhs.gov/dhspublic)
PHMSA	U.S. Department of Transportation - Pipeline and Hazardous Materials Safety Administration
POV	privately (personally) owned vehicle
O_2	Oxygen [air quality component]
OPS	[in the context of the PHMSA] Office of Pipeline Safety
ROW	right-of-way
RH	relative humidity (percentage)
SCBA	self contained breathing apparatus
SOP's	Standard Operating Procedures (as issued by a Police or Fire Department)
sec	second [time measurement]
sq.	square [miles]
y.o.	year old [age]

[2] an international nonprofit organization, which produces and advocates scientifically-based consensus codes and standards, many of which have been adopted as a required safety standard by various municipal and jurisdictional authorities (see [Internet]: http://www.nfpa.org).

A. Accident Reference Information

NTSB Accident Number:	DCA 08 MP 001
Location:	Carmichael, Mississippi
Date:	November 1, 2007
Type of Incident:	Rupture / Product Release (liquid propane)
Pipeline Owner / Operator:	Dixie Pipeline Company
Management service provider:	Enterprise Products Operating, LLC

B. Accident Synopsis[3]

On November 1, 2007, at 10:35:01 a.m. CDT[4], a 12-inch diameter, underground transmission pipeline[5], owned and operated by the Dixie Pipeline Company, and managed by Enterprise Products Operating, LLC (EPOLLC), was transporting liquid propane at about 1405 psig, when it ruptured in a rural area near Carmichael, Mississippi. Upon being released to the lower pressure of the atmosphere, the liquid propane changed to a low-lying gas cloud, which expanded over an area including nearby homes.

The propane vapor cloud ignited as a large fireball plume, which (based upon witness testimony, and constructed Timeline data) was estimated to have likely occurred about 7½ minutes after the pipeline rupture occurred, and resulted in a pronounced cloud of heavy black smoke, which was heard and seen miles away.

The ensuing fire destroyed four residential dwellings and structurally damaged several others. Two fatalities occurred, and the investigation identified a total of seven civilian individuals presented (self-transported) to medical facilities for emergency medical examination and/or treatment, with a complaint that the patient indicated was associated with the event, in which all of the injuries were considered "minor", in which also all of the individuals were subsequently treated and released. There are no reported emergency responder or pipeline employee injuries. Post-accident toxicological tests of the pipeline Operations personnel were performed. About 60 families were evacuated from about a one-mile radius of the rupture site. The burned area encompassed a total area of about 71.4 acres (mostly grassland / woodlands).

The Carmichael Volunteer Fire Department and the Clarke County Sheriff Department responded. A number of mutual aid fire departments and police departments were also dispatched to the scene, which ultimately included several hundred emergency response personnel (of the various local, county, and state agencies that responded). Fire at the pipeline rupture site, from the residual propane vapors (remaining in the pipeline between isolation valves), continued into the following day. Ultimately, about 10,253 barrels (about 430,500 gallons) of liquid propane

[3] preliminary, as compiled by the Survival Factors – Working Group Chairperson, subject to revision by the Investigator-in-Charge
[4] Central Daylight Time
[5] as represented by the pipeline owner / operator, and the management service provider, the pipeline in the area proximate to the breach was about 30 inches beneath the soil surface.

were released.

The pipeline is controlled by means of a supervisory control and data acquisition system from a control center in Houston, Texas. At 10:35 a.m. central daylight time, several alarms began to register at the control center. At 10:36 a.m., a controller began shutting down the pipeline, and starting up a pump at the next downstream pump station to pull product away from the rupture area. The controller also dispatched several field personnel to the accident scene, placed and received numerous telephone calls (including Dixie Pipeline / EPOLLC personnel, the public reporting explosions, the Clarke County 911 Center, and another pipeline company with a pipeline in the area). He continued to shut down the pipeline, and issued commands to shut the remotely controlled Carmichael station suction and discharge valves at 10:55 a.m. The fire was allowed to continue, in a controlled 'burn-off' of residue propane in the pipeline, where it self-extinguished the following day.

The recorded weather[6] at the time of the accident was about 69 degrees F., under clear skies, with a wind from the northeast at about 7 mph.

Parties to the investigation include NTSB, Dixie Pipeline Company / Enterprise Products Operating, LLC[7], Carmichael Volunteer Fire Department, Clarke County Sheriff Department, and U.S. Department of Transportation - Pipeline and Hazardous Materials Safety Administration (PHMSA).

[6] for the nearest NWS reporting station (about 27 mi. to the north): Key Field Airport (Station # 13865), Meridian , MS. Ambient temperature cited is extrapolated from contemporaneous recorded climatological data.
[7] as the identified owner / operator, and management service provider, respectively, of the pipeline.

C. **Survival Factors -- Working Group Participants**

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[8] this individual jointly represented the pipeline owner / operator, and management service provider (for the pipeline operator), respectively, as the designated Party to the Investigation representative.

D. **Facts of the Investigation**[9]

1.0 Pipeline Operations - Summary Overview

The underground transmission pipeline involved in this accident is owned and operated by the Dixie Pipeline Company[10] (Dixie), and is managed by a "management service provider", under a commercial arrangement, by Enterprise Products Operating, LLC[11] (EPOLLC)[12]. Additional information detail on these business entities is summarized as follows.

1.1 Pipeline Owner[13]

Dixie Pipeline Company, which was founded in 1961 and is based in Houston, TX, owns and operates the pipeline involved in the accident that transports propane from natural gas liquid (NGL) fractionators and refineries to customers in the southeastern United States. The Dixie Pipeline Company[14] is a corporation that is owned 74.2% by subsidiaries of Enterprise Products Partners L.P.[15], which, through a separate business subsidiary of that company, by the name of Enterprise Products Operating, LLC, also manages the pipeline system involved in the accident (as further described in this report; see § 1.2). Dixie Pipeline Company refers to the pipeline segment that was involved in the accident as the "Mont Belvieu – Raleigh Line" [16].

As described by the company, "The *Dixie Pipeline* is a regulated propane pipeline extending from southeast Texas and Louisiana to markets in the southeastern United States. Propane supplies transported on this system primarily originate from southeast Texas, southern Louisiana and Mississippi. This system operates in seven states: Texas, Louisiana, Mississippi, Alabama, Georgia, South Carolina and North Carolina." [17]. Dixie directly employs about 80 individuals in its pipeline operations.

The pipeline involved in the accident is about 1,300 miles in length, which originates (at its western terminus) in Mont Belvieu, TX and terminates (at its eastern terminus) in Apex, NC, with a branch pipeline extending from Opelika, AL, to Alma, GA. The pipeline was installed

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[9] comprised of on-scene, and subsequently received information from the designated Party representatives, and other sources as noted, as compiled by the Survival Factors - Working Group Chairperson, with the information reported to reflect the facts at the time of the accident (unless noted otherwise).
[10] ref., and for further information, see [Internet] http://www.dixiepipeline.com/
[11] ref., and for further information, see [Internet] http://www.eprod.com/, and http://www.epplp.com/
[12] ref. correspondence [emails] from Dixie / Enterprise Products staff during the draft Factual report tech review process.
[13] ref. Form 10-Q filed by Enterprise Products Partners L.P. with the Securities and Exchange Commission, for the fiscal quarterly period ending Sept. 30, 2007 (the most recent data on file that references to the accident), and other sources as noted.
[14] Dixie Pipeline Company, Inc. is Incorporated in Delaware; the Corporate address of record and principal executive offices are: 1100 Louisiana, Houston, TX 77002.
[15] ref. Form 10-Q [page 3] filed with SEC by EPE Holdings, LLC, dated Nov. 19, 2007, for the Quarter ending Sept. 30, 2007; [Internet] http://www.secinfo.com/d18dhv.uj.d.htm
[16] referenced as such in company 'alignment maps', and other documentation
[17] from Enterprise Products Partners L.P. 2006 Annual Report (Form 10-K) filed with SEC (the most recent filed prior to the accident); ref. [Internet] http://phx.corporateir.net/phoenix.zhtml?c=80547&p=irolsec&secCat01.1_rs=71&secCat01.1_rc=10&control_symbol=

circa 1961, and transports an average of approximately 100,000 barrels[18] of liquid propane per day.

A schematic map, illustrating the Dixie Pipeline System, is provided in Exhibit 1.

1.2 Pipeline Management Service Provider[19]

The pipeline involved in this accident is owned and operated by the Dixie Pipeline Company, and is managed by a "management service provider", under a commercial arrangement, by Enterprise Products Operating, L.L.C. (also referred to as "EPOLLC" by the company). EPOLLC is a "wholly-owned subsidiary" of Enterprise Products Partners L.P.[20], a publicly held entity, whose General Partner is Enterprise Products GP, LLC[21].

Enterprise Products Partners L.P. is principally engaged as "…a North American midstream energy company providing a wide range of services to producers and consumers of natural gas, natural gas liquids ("NGLs"), crude oil, and certain petrochemicals. In addition, we are an industry leader in the development of pipeline and other midstream energy infrastructure in the continental United States and Gulf of Mexico" [22].

Enterprise Products Partners L.P. has no employees. All management, administrative and operating functions are performed by employees of EPCO, Inc.[23], pursuant to an administrative services agreement. As of December 31, 2007, there were approximately 3,200 EPCO, Inc. personnel that spend all or a portion of their time engaged in Enterprise Products Partners L.P business. Approximately 1,900 of these individuals devote all of their time performing management and operating duties for Enterprise Products Partners L.P.

EPOLLC owns, manages, and/or operates approximately 33,000 miles of pipeline in 17 States, which includes commercial pipeline systems that are owned by other entities, which includes the pipeline system (involved in the accident) owned by Dixie. EPOLLC maintains its system Operations offices, including pipeline control Operations, in Houston, TX, and maintains a local Operations office in Petal, MS.

1.3 Common Nomenclature Reference Used in this Report

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[18] per definition under 49 CFR 195.2, one barrel [petroleum products] = 42 gallons (US)

[19] ref. [Internet] http://www.eprod.com/index.html, and information provided by the Party representative for Dixie / Enterprise Products (during the draft Factual report technical review process), and other sources as noted.

[20] Enterprise Products Partners L.P. is incorporated in Delaware; the corporate address of record and principal executive offices are: 1100 Louisiana, 10th Floor, Houston, TX 77002.

[21] ref. Form 10-Q [page 3] filed with SEC by EPE Holdings, LLC, dated Nov. 19, 2007, for the Quarter ending Sept. 30, 2007; [Internet] http://www.secinfo.com/d18dhv.uj.d.htm
Enterprise Products Partners L.P. 2006 Annual Report (the most recent filed prior to the accident); [Internet] http://phx.corporateir.net/phoenix.zhtml?c=80547&p=irolsec&secCat01.1_rs=71&secCat01.1_rc=10&control_symbol=

[22] ref. Enterprise Products Partners L.P. 2006 Annual Report (most recent filed prior to the accident); [Internet] http://phx.corporateir.net/phoenix.zhtml?c=80547&p=irolsec&secCat01.1_rs=71&secCat01.1_rc=10&control_symbol=

[23] EPCO, Inc. is a private company controlled by Dan L. Duncan, who is also a director and Chairman of Enterprise Products GP, LLC. (as described in [Internet] http://www.secinfo.com/$/SEC/Name.asp?S=dan+l%2E+duncan)

In consideration of the above described, somewhat complex, interlaced relationship between the above referenced pipeline owner / operator [Dixie Pipeline Company] and the management service provider [Enterprise Products Operating, LLC], for purposes providing a succinct *common nomenclature reference* for the pipeline owner / operator and the management service provider in this investigation report, in as much as the complexity of the corporate arrangement is not necessary to depict the salient facts of the Survival Factors investigation, irrespective of which particular corporate entity is involved or to be specifically referenced, the collective entities of the Dixie Pipeline Company and/or Enterprise Products Operating, LLC, or any of the other corporate entities mentioned above, hereafter in this report are referred to as "Dixie / Enterprise Products".

1.4 Property Owner

At the rupture site, the pipeline traverses privately owned property[24], the arrangement of which is governed under a conventional 'right-of-way provision' in the property ownership title, in which also the property owner has no operational involvement in the pipeline. At the time of the rupture, the property (in the area immediately proximate to the rupture site) was being utilized substantially as open pasture for livestock (cattle), which normally is not an impediment to pipeline operations[25]. Other livestock (goats and chickens) were located on property immediately adjacent to the rupture site.

2.0 Accident Site

The pipeline right-of-way proximate to the rupture site traverses through an open field (cattle pasture) in the community of Carmichael, MS, which is in a relatively rural area of the eastern sector of central Mississippi.

Additional information on the accident site locality is as follows.

2.1 General Description of the Locale

2.1.1 Municipality

The pipeline rupture occurred in an open field, in a relatively unpopulated area, in the community of Carmichael, MS[26], in an unincorporated section of Clarke County. The accident site is about 12 miles southeast[27] of the southern jurisdictional boundary of the City of Quitman, and is about 3 miles north of the boundary of Wayne County and is about 3½ miles west of the Alabama [state] boundary (Choctaw County). Quitman is the Clarke County seat, the southern jurisdictional boundary of which is about 23 miles south of the southern jurisdictional boundary

[24] ref. Clarke County [Real Property] Appraisal Office (Tax Rolls); Map # 149, Lot # 12
[25] the 'right-of-way provision' prohibits excavation, or other activity proximate to the pipeline, which might jeopardize the integrity of the pipeline
[26] certain maps examined by the Investigation identified a community by the name of "Horn" to be located proximate to the accident site, although the local population universally described the area proximate to the accident site as being within the community of "Carmichael".
[27] all distances referenced in this section are 'direct-line' measurements

of Meridian, MS. Clarke County has a population of 21,979 and has an area of about 416 sq. mi.[28].

The accident site locale, proximate to the rupture site[29], is estimated to have a population of about 200 residents[30, 31]. The pipeline right-of-way in this vicinity is flanked on both sides by open (uncultivated) fields and wooded lots. There is a cluster of six residential dwellings located in an area commencing about 512 feet to the southwest of the rupture site, with an additional cluster of five residential dwellings located a short distance further to the south, for a total of 11 residential dwellings in that area (all located on County Road 621), as further described in this report (see § 4.2). County Road 621, which extends eastward from the intersection of County Road 620, provides vehicle access to the 11 residential dwellings at this location, and has no other roadway connection at its eastern end.

The local economic infrastructure is principally agriculturally based (e.g. conventional commercial farms or cattle operations, about a half-dozen crude oil pumping ("pump-jack") facilities, and some scattered timber logging), and other than a few commercially operated poultry hatchery / egg production, or related facilities[32], there are no other commercial establishments proximate to the accident site[33].

Access to the accident site (for emergency services vehicles) was afforded by a number of two-lane paved roadways within the community.

In addition to the Dixie Pipeline, the investigation identified that Clarke County is traversed by numerous hazardous liquid and gas transmission pipelines[34].

2.1.2 Topography / Geography[35]

The community of Carmichael (immediately proximate to the rupture site), having an elevation of about 300 feet (above sea level), is located in a topography of subtle rolling hills, which is generally comprised of wooded areas and open fields.

In the area immediately proximate to the rupture site, the pipeline right-of-way essentially follows a linear alignment, and is geographically oriented generally in a southwest / northeast (compass) direction. At the rupture site the pipeline right-of-way traverses through an open field, which was being utilized (by the property owner) substantially as livestock (cattle) pasture. The

[28] source: 2000 US Census; for further data, see [Internet] >> http://www.census.gov/statab/ccdb/cc07_tabB1.pdf
[29] proximity, in this context, refers to approximately a one-mile radius of the rupture site
[30] cited population estimate as offered by officials of local emergency response agencies.
[31] note - the US Census does not identify Carmichael, MS, as a "census designated place", and thus does not report data for the community that was effected by rupture and [propane] product release.
[32] a poultry raising operation, principally comprised of large, barn-like structures, known locally as "chicken houses"
[33] proximity, in this context, refers to approximately a one-mile radius of the rupture site
[34] source: PHMSA National Pipeline Mapping System (as described in, and for further information, see [Internet] http://www.npms.phmsa.dot.gov/), in which at least 10 hazardous liquid and gas transmission pipelines were identified (in the GIS dataset) to be located in Clarke County (as described in, and for further information, see [Internet] http://www.npms.phmsa.dot.gov/publicsearch/Attribute.asp?AreaType=COUNTY&AreaValue=28023).
[35] source: on-scene visual examination by the Survival Factors Group, and U.S. Geological Survey topographical map data (see [Internet] >> http://www.usgs.gov)

topography elevates slightly both to the east, and to the west of the rupture site, such that the rupture site is located at the base of a shallow valley. There is a small, shallow (water filled) pond located about 100 feet to the south of the rupture site, which measures about 100 feet wide and extends about 500 hundred feet further to the south.

The total of 11 residential dwellings, located in two clusters of residential dwellings commencing about 512 feet to the southwest of the pipeline rupture site (as further described in this report; see § 4.2), is at an elevation that was visually estimated to be about 12 feet higher than the elevation of the rupture site[36]. The pipeline right-of-way to the west of the rupture site intersects with (i.e. the pipeline passes beneath) County Road 621.

The pipeline right-of-way extending to the east and west of the rupture site passes through somewhat wooded areas, with trees / shrubs within the right-of-way cleared along the centerline for a width of about 100 feet, which allows the pipeline right-of-way to be visibly evident to the public. Warning marker signs, to alert the public to the pipeline's presence, are periodically located along the right-of-way, to identify the pipeline location, product transported, and to provide emergency contact information[37].

The Dixie / Enterprise Products pipeline intersects with (i.e. passes above[38]) another underground transmission pipeline[39], a distance of about 170 feet to the east of the eastern end of the pipeline rupture site[40]. Based upon field interviews with operational principals of the other [intersecting] pipeline, no evidence or information presented that was consistent with any suggestion that the other pipeline was involved with, or was otherwise significantly impaired by[41], the rupture of the Dixie / Enterprise Products pipeline[42].

Maps of the accident site and vicinity are provided in Exhibit 2.

Additional detailed mapping of the accident site, proximate to the pipeline rupture (trench) and the area proximate to the damaged residential structures, was performed in the Investigation (as further described in this report; see § 5.4.1).

Additional detail information on the pipeline right-of-way is provided in the Pipeline Operations Group - Factual Report of the investigation.

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[36] elevation data is estimated, where reliance should be made to more accurate topographical data as recorded (on-scene) by professional survey crews (as further described in this report; see § 5.4.1).
[37] markers installed pursuant to 49 CFR 195.410
[38] although both pipelines are buried, the Dixie / Enterprise Products pipeline passes several feet above the other pipeline.
[39] an eight inch diameter pipeline, owned / operated by the Hunt Crude Oil Supply Company
[40] the pipeline ruptured along the upper surface of the pipe (measuring about 53 feet in length), which also resulted in the formation of a trench having a slightly longer dimension (as further described in this report; see § 5.1.1).
[41] although not considered as impairment, per se, as a precautionary measure, the Hunt Oil pipeline did voluntarily cease operations (terminated production flow) for a period of time, by the closure of [flow control] 'block valves' during the incident (isolating the segment of pipeline proximate to the intersection).
[42] ref. post-incident informal debriefing with operational staff of Hunt Oil pumping station (Nov. 8, 2007)

2.2 Meteorological[43]

As a brief summary, weather (at the nearest NWS[44] reporting weather station) at the approximate time of the accident[45] was reported as daytime, a clear sky (i.e. no precipitation), with a surface visibility of 10 miles, wind from the north-northeast (30° true) at about 7 mph (~ 6 kts) with no significant wind gusts reported, a ground level atmospheric temperature [dry bulb] of 69°F (~ 21°C), a DP of 50°F (~ 10°C), a RH of 51%, and a BP of 29.97 in. Hg. Sunrise was reported to occur at 6:37 am, and sunset at 4:49 pm[46].

Meteorological data detail for the time interval of the accident date is available (in the public docket) as a separate document to this report.

3.0 Pipeline Equipment / Product Transported – Brief Summary[47]

As a brief summarization, the pipeline was installed approximately in 1961, and transports an average of about 100,000 barrels (4.2 million gal.[48]) of pressurized liquid propane per day, in which the product flow (in the segment of pipeline involved in the accident) is eastbound. In the area of the rupture site, the pipeline was buried (covered with soil) to a depth of about 2½ feet. The product flow through the pipeline is controlled by means of a 'supervisory control and data acquisition' (SCADA) system from an Operations Control center (facility), which is located in Houston, Texas[49]. Additional specifications of the pipeline, product transported, and pumping operation, are briefly summarized as follows.

3.1 Pipeline Mechanical Configuration[50]

The pipeline was fabricated utilizing lengths of carbon steel pipe, with a welded seam construction (girth and longitudinal seams), having a nominal outside diameter of 12.750 inches, and a nominal wall thickness of 0.250 inches.

The measured pipe dimensions (noted above) are consistent with a standard Schedule 20, 12¾ inch nominal diameter, commercial steel pipe, having an inside diameter of 12.250 inches and an inside (cross-sectional) area of 117.9 square inches[51].

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[43] source, except as noted otherwise: NOAA -Record of Climatological Observations / Unedited Surface Weather Observations [weather data archive] for station site "Key Field [Airport]", WBAN 13865, ASOS Meridian, MS, which is about 27 miles north of the accident site.
[44] National Weather Service - automated data recording / data archiving facility
[45] the accident was identified to have occurred at about 10:35 am; the NOAA [weather] data reported in this investigation was identified as the closest recorded data relative to when the [accident] event occurred, which for this event, the data was recorded at 10:56 am, which is about 21 minutes after the accident reportedly occurred.
[46] source: [Internet] http://aa.usno.navy.mil/cgi-bin/aa_pap.pl
[47] technical references in this section are specific to the pipeline location proximate to the rupture site, unless noted otherwise
[48] per definition under 49 CFR 195.2, one barrel [petroleum products] = 42 gallons (US)
[49] activities of the Operations Control center in Houston are addressed in the Human Performance investigation.
[50] source: NTSB Materials Laboratory / Factual Report of the Investigation, and other sources as noted.
[51] ref. Avallone, Baumeister III, and Sadegh; Marks' Standard Handbook for Mechanical Engineers, 10th Ed., November 2006, McGraw Hill, New York, NY (Chapter 8.7: Table 8.7.3 "Properties of Commercial Steel Pipe")

Additional information detail on the mechanical aspects of the pipe / pipeline is provided in the [NTSB] Materials Laboratory - Factual Report of the investigation.

3.2 Product Transported

The product transported was liquid propane, which is a highly volatile, and highly combustible, petroleum based product.

A copy of the product specification for this product, as published by Dixie / Enterprise Products, is provided in Exhibit 3.

A copy of the Material Safety Data Sheet (MSDS) for this product, as published by Dixie / Enterprise Products, is provided in Exhibit 4.

3.3 Pressure / Flow Rate[52]

The 'normal' pressure of the product, proximate to the rupture site (i.e. Carmichael pumping station), during routine operations is about 1400 psig[53].

SCADA data indicated the [liquid propane] product was being transported through the pipeline (i.e. at the Carmichael pumping station), at the time just prior to the rupture, at a flow rate of about 5,400 barrels per hour (226,800 gph[54]).

Additional information detail on this topic is provided in the Operations Group - Factual Report of the investigation.

3.4 Pumping Stations

Basically described, the pumping stations, which contain electrically powered pumps[55], flow control ("block") valves, and related equipment, are automated[56], and have instrumentation fitted to the piping and pumps to monitor product flow rate and product pressure, which identifies to Operations Control the operating state of the product flowing through the pumping system. The pumps at the pumping stations do not have the capability of reversing the directional flow of product being pumped through the pipeline.

Block valves are also periodically located along the length of the pipeline (between pumping stations) to provide the capability of isolating a given length segment of pipeline between the individual block valves and/or pumping stations.

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[52] source: SCADA documentation submitted to the investigation by Dixie / Enterprise Products
[53] pounds per square inch, gauge [pressure]
[54] gallons per hour
[55] pumps at a pumping station propel the product though the pipeline
[56] Dixie Pipeline pumping stations are normally controlled remotely by Operations Control (in Houston, TX) and are not normally staffed, however, technicians (while at a given pumping station) can manually control the pumps, operate control valves and other equipment, etc. as needed.

There are three pumping stations proximate to the accident site that are identified as consequential to the event[57]. The Butler pumping station (in Alabama) is located at Milepost[58] (MP) 443.78, which is about 17.86 miles east of the rupture site. The Carmichael pumping station is located at MP 425.48, which is about 2,650 feet west of the rupture site[59]. The Yellow Creek pumping station is located at MP 406.20, which is about 20.08 miles west of the Carmichael pumping station.

A schematic map, illustrating the configuration of the three pipeline pumping stations in the Carmichael, MS, area is provided in Exhibit 5.

4.0 Damaged Property Significant to the Survival Factors Investigation[60]

4.1 Woodlands / Grassland

Woodlands and grassland immediately proximate to the pipeline rupture site received fire damage in the explosive ignition of the released product [propane] and ensuing fire, which encompassed a total area estimated to be about 71.4 acres[61]. No monetary value was placed on the damage sustained to the woodlands and grassland[62], although the loss of timber content of the woodlands likely would have an inherent monetary value, where the grassland is suspected to recover (re-grow) without inordinate difficulty.

4.2 Residential Dwellings

Two clusters of residential dwellings located near the accident site, encompassing a total of 11 residential dwellings, were affected by the accident, which are briefly summarized as follows.

Several maps describing the layout configuration of the residential dwellings located proximate to the accident site (as further described in this report; see § 5.4.1.b) are provided in Exhibit 6.

4.2.1 Cluster of Six Residential Dwellings

There is a cluster of six residential dwellings located commencing about 512 feet to the southwest of the pipeline rupture site, and extending in a western direction a distance of about

[57] source: map document compiled by a Dixie / Enterprise Products contractor: Environmental Mapping Services, Inc., of Hattiesburg, MS. ([Internet] >> http://www.env-mgt.com/, as further described in this report; see § 5.4.1.a).
[58] a Milepost is a distance location reference point along the pipeline length, as measured from an initiation point in miles, or [decimal] fractions thereof.
[59] note - the 2,650 feet dimension cited in the map document is based upon a starting point used by the surveyors which is very close to the "discharge block valve" located at the Carmichael pumping station, which may not be the same starting point that was utilized in other measurements performed in the investigation to identify the distance between the rupture site and the Carmichael pumping station (i.e. other documentation provided to the investigation identifies this distance as about 2,900 feet).
[60] i.e. factors that influenced the emergency response to the accident; execution of incident command / fire suppression tactics / mitigation of environmental distress (resulting from a significant release of product content).
[61] the initial estimate of fire-damaged woodlands and grassland was placed at about 150 acres (by local emergency response officials), which was later revised, using (more precise) aerial photography techniques.
[62] damage claim data reviewed by the investigation was preliminary and subject to final negotiations, and thus was not further documented / reported in the investigation.

500 feet. The six residential dwellings consisted of semi-permanently constructed (fixed in-place) manufactured homes (a.k.a. mobile homes), and conventional wood-frame structures, which were located in the 4100 and 4200 block of County Road 621. The dwellings are at an elevation that was visually estimated to be about 12 feet higher than the elevation of the rupture site[63].

Four of the residential dwellings were fully consumed (burned to the ground) by fire, in which two individuals (residents) of these dwellings perished as a result of the fire (as further described in this report; see § 5.2, and § 8.1.2).

4.2.2 Cluster of Five Residential Dwellings

There is an additional cluster of five residential dwellings on County Road 621, located commencing about 600 feet further to the south of the southern-most point of the (above described) cluster of six residential dwellings, for a total of 11 residential dwellings in that general area. The five dwellings consisted of semi-permanently constructed 'manufactured homes', and conventional wood-frame structures, which were located in the 4300 block of County Road 621, in which several of these dwellings were reported to have received damage in the event (as further described in this report; see § 5.2).

5.0 Examination of the Accident Site[64]

Of significant interest to the Survival Factors investigation are the conditions of the pipeline equipment[65], and the residential dwellings that sustained some degree of damage (where also the casualties were located), which, in conjunction with the topography proximate the accident site, may provide information, or evidentiary artifacts, which collectively may help identify factors that influenced the survivability of individuals proximate to the accident site, and/or influenced the emergency response to the accident.

Photographs of exemplary damage (described below) were taken by the Survival Factors investigation (i.e. by Safety Board staff, as well as principals of the Parties to the Investigation), selected images of which are to be provided in a separate Addendum to the Survival Factors Factual Report of the Investigation.

A brief summary of the accident site examination is as follows.

5.1 Pipeline Rupture Site Examination

5.1.1 Condition of the Ruptured Pipeline

[63] elevation data is estimated, where reliance should be made to more accurate topographical data as recorded by a survey crew on-scene, as further described in this report (see § 5.4.1)
[64] referring only to the topography / terrain environment proximate to the accident site, and the general configuration / conditions of pipeline equipment at the scene
[65] e.g. the degree and extent of pipeline rupture, product [release] flow rate, etc.

The pipeline rupture occurred in an open field, where the pipeline was reportedly buried (covered with soil) to a depth of about 2½ feet.

In an examination of the site by the Survival Factors Group, an open, somewhat triangular-shaped, trench containing the pipeline was found, which was visually to be measured[66] to be about two to three feet deep and about 20 feet wide (at the surface), which presumably resulted from the reported rupture, in which all of the soil above the pipeline was pushed upward and displaced laterally outward. A trench berm was created, presumably also from the reported rupture, which was comprised of a mound of the displaced soil on both longitudinal sides of the trench, which measured about three feet high and up to about ten feet wide. Grayish / white ash was visible in places at the surface of the trench berm, which appeared to be clumps of vegetation that had burned.

Within the trench was an exposed length of damaged pipeline that extended about 53 feet. The exposed pipeline displayed an obvious rupture, consisting of an opening that extended longitudinally along the top of the exposed pipeline for a distance of about 53 feet. The rupture measured about 18 to 24 inches wide[67] at the west end, which tapered down to less than an inch at the east end. When examined by investigative staff[68], small fires were burning at both ends of the exposed length of pipeline, which technical staff of Dixie / Enterprise Products indicated was residual product [propane] burn-off.

Additional information detail of the pipeline condition is provided in the [NTSB] Operations Group Factual Report, and Materials Laboratory Factual Report(s).

5.1.2 Geographic Area Proximate to the Ruptured Pipeline

Grassland proximate to the trench was burned, and the trees over a wide area displayed indications of fire damage. According to post-event site survey documentation[69], the estimate of fire-damaged woodlands and grassland area was placed at about 71.4 acres[70].

Approximately 40 head of cattle were reported to have been located proximate to the pipeline rupture site at the time of the explosion, many of which were either fatally injured (as a direct result of the explosion), or were subsequently euthanized (due to irrecoverable injuries received).

No artifacts as might be utilized for excavation processes (e.g. hand tools [shovels, pickaxe], or motorized excavation equipment [backhoe / loader], etc.) were found in the area proximate to the pipeline rupture site.

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[66] due to time and safety constraints (residual propane was still burning at the rupture location), only an informal, visual measurement was made at that time, as a more accurate, formal survey of the site (by a professional survey crew) was to be forthcoming, which also should be relied upon for actual dimensions of the pipe, trench, etc.

[67] i.e. the pipe casing essentially had "peeled-back" laterally during the rupture process, where the measured edges of the rupture opening were larger than the pipe diameter, in which also the measured width varied (~ 18 to 24 inches) depending on where the dimension was taken.

[68] at approximately noon on November 2.

[69] as described in § 5.4.1.a.

[70] the initial estimate of fire-damaged woodlands and grassland was placed at about 150 acres (by local emergency response officials), which was later revised, using (more precise) aerial photography techniques.

5.1.3 Quantity of Product Released[71]

Ultimately, about 10,253 barrels (about 430,500 gallons) of liquid propane were released.

5.2 Residential Dwellings[72, 73]

Of the cluster of six residential dwellings located on County Road 621 (as described in § 4.2.1 in this report), commencing about 512 feet to the southwest of the pipeline rupture site, and extending in a western direction a distance of about 500 feet:

- Two of the six residential dwellings were reported to have received "moderate" damage. As the identified damage did not destroy the structure, and no loss of life occurred in these dwellings, these residential dwellings were not further examined in the investigation.

- Four of the six residential dwellings were fully consumed (burned to the ground) by fire, in which two individuals (residents) of these dwellings perished as a result of the fire (as further described in this report; see § 8.1.2). The sites of the four residential dwellings were physically examined in the investigation to document the degree of damage sustained, the results of which are briefly summarized further in this report (see § 5.2.1).

Of the cluster of five other residential dwellings located on County Road 621 (ref. § 4.2.2 in this report), commencing about 600 feet further to the south of the southern-most point of the cluster of six residential dwellings (noted above), several of these residential dwellings were reported to have received some heat (fire) damage, and/or some structural damage in the event. As the identified damage did not destroy the structures, and no loss of life occurred in these dwellings, these five residential dwellings were not further examined in the investigation.

5.2.1 Summary Forensic Site Examination

To make a determination of the degree of damage sustained by the above-described residential dwellings proximate to the accident site, the Survival Factors investigative Group conducted a Summary Forensic Examination of the four residential dwellings that sustained extensive fire damage in the accident, the results of which are briefly summarized in Exhibit 7.

5.2.2 Laboratory Forensic Examination

Responsive to the Summary Field Forensic Examination conducted on the four residential dwellings that sustained fire damage (ref. § 5.2.1 in this report), to potentially identify a prospective source of fire ignition, a Laboratory Forensic Examination was performed by the

[71] source: Dixie / Enterprise Products
[72] source: first-hand physical examination by the participants of the Survival Factors Working Group, or (as specifically noted) authoritative documentation as received by the investigation.
[73] additional damage description data: settlement claim documentation [sanitized of personal-identifiable information] as compiled by the pipeline owner / operator - management service provider.

NTSB Materials Laboratory on a forensic specimen [artifact] that was recovered from one of the four residential dwellings examined.

The evidentiary artifact recovered consisted of a short length fragment of two electrical power feed wires, which were recovered from an electrically powered hot water heater, which were "partially" twisted together[74] in an apparent effort of making a correct electrical wiring connection. The artifact displayed obvious extensive fire exposure damage, which also drew the attention of the Investigation based upon the observation expressed by a Party to the Investigation participant[75] (during the field forensic examination process), indicating that prevailing professional practice was to provide the electrical power feed for such an application by use of a single continuous wire, with no intermediate ("twisted wire with wire nut") connections.

The potential significance of this evidence to the Investigation was that a resulting electrical spark occurring at the contact surfaces where these two wires were partially twisted together (when this appliance was energized), may have resulted in the ignition of propane gas, which may have migrated into the dwelling upon release from the nearby ruptured pipeline.

In an effort of attempting to make a factual determination if the artifact contributed to the ignition of propane gas, as might be shown by an indication that is consistent with evidence of electrical arcing (e.g. micro-pitting, beading, or localized material erosion, etc.) on the contact surfaces where the wire fragments were "partially" twisted together, a formal laboratory forensic examination was performed on the specimen by the NTSB Materials Laboratory[76].

Briefly summarized, the Materials Laboratory Factual Report[77] on the examination of the specimen indicated "… Upon microscopic examination, no damage, such as pitting, beading or erosion that would indicate an electrical arc, was found to the conductor of either wire."

A copy of the above-described Materials Laboratory Factual Report is available in the NTSB public docket, as a separate document to this report.

5.2.3 Other Forensic Evidence Identified

The Summary Forensic Examination of the residential dwellings also revealed the presence of, in several of the dwellings, other spark or heat bearing appliances (in addition to the above identified electric hot water heater) that could have been, due to the inherent operational function of the appliance, contributory to the ignition of propane gas. Such appliances, all of which displayed obvious extensive fire exposure damage, included, as identified examples:

[74] the characterization "partially" twisted together is employed to describe the manner in which the wires were joined, in that it was observed that the two individual wire elements had been wrapped around each other almost one full twist, the two wires of which then, when being removed from the hot water heater appliance (i.e. when collectively clipped with a wire cutter), immediately "fell-apart" as they were being placed into an evidence recovery container, in which also no remnant (metal 'spring' element) of a "wire nut" was found at that location.
[75] the Party to the Investigation participant indicated that he had experience as a licensed electrician, and thus was familiar with prevailing professional practice relative to this particular electrical appliance.
[76] located at NTSB Headquarters, Washington, DC
[77] ref. [NTSB] Materials Laboratory Factual Report Number 08-003, dated January 16, 2008.

- LPG [78] powered hot water heater(s), which utilize an open-flame pilot light as an ignition source of the fuel
- electric powered space heater, which utilize electrically heated elements as an inherent operational function of the appliance
- LPG powered space heater, which utilizes an open-flame pilot light as an ignition source of the fuel

In as much as any one of the above noted example appliances potentially could have contributed to the ignition of propane gas (as might have migrated into the structures), in which also the ignition of propane gas by such appliances might not be conclusively identified utilizing forensic examination processes, the noted example appliance (artifacts) were not recovered, and no forensic examination was performed on the artifacts.

5.3 Geographic Area Proximate to the Residential Dwellings

Visual examination of the grass, trees, and other natural, and artificial (man-made), features and elements proximate to the residential dwellings, revealed extensive heat charring and fire scorching. As brief, summarized examples:

- Fire / heat damage to trees consisted of fire scorching to main trunk areas and extended branches, where the tips of the branches had burned away, where also the fire / heat damage extended vertically up the tree only to a level visually estimated to be about 40 feet.

- Fire / heat damage on a wood split-rail fence-post (proximate to the west side of the fire destroyed residence at the # 4207 County Road 621 address) was observed on the west side of the vertical fence posts, but not observed to such a degree on the east side of the fence-post.

- Heat damage found on a large plastic bucket (melting), which was resting on the ground (proximate to the east side of the fire destroyed residence at the # 4167 County Road 621 address), although the grass upon which it rested was not scorched to an excessive degree (as might be expected, given the extent of melted plastic).

- Melted aluminum of an automobile wheel rim was found (proximate to the east side of the fire destroyed residence at the # 4201 County Road 621 address).

- In the area of the pond berm (south end), fire / heat damage was observed to trees and grass areas, yet small pine scrub trees on the pond berm did not exhibit fire / heat damage.

5.4 Formal Documentation of the Accident Site

[78] liquefied petroleum gas (a.k.a. “bottled gas”)

5.4.1 Professional Engineering Survey Mapping

As support to the investigation, two organizations performed formal engineering survey mapping of the accident site, which was made available to the investigation, the full documentation of which is anticipated to be available in the NTSB public docket. The survey maps were utilized by the Survival Factors investigation to identify the overall configuration of the accident site, and to characterize, to the extent possible, the infrastructure elements involved in the accident (e.g. topographical features, location / orientation of residential dwellings and fatalities [relative to the pipe rupture location], approximate dimensions of the [woodland/grassland] fire damaged area).

The content of the survey map documentation is briefly summarized as follows.

a. Dixie / Enterprise Products

Dixie / Enterprise Products commissioned a professional engineering survey contractor by the name of Environmental Mapping Services, Inc.[79], to conduct a survey of the accident site, in which a series of four survey maps were compiled for the investigation, which are identified as follows[80].

Sheet Title / Description

1. "Contour and Feature Plan W/ Aerial, 12 inch Propane Pipeline, Carmichael Station to Stopper Plug, Carmichael, Mississippi", dated 12-19-07, showing topographical features as imposed upon an aerial photograph.
2. "Contour and Feature Plan, 12 inch Propane Pipeline, Carmichael Station to Stopper Plug, Carmichael, Mississippi", dated 12-19-07, showing topographical features.
3. "Plan and Profile, 12 inch Propane Pipeline, Carmichael Station to Stopper Plug, Carmichael, Mississippi", dated 11-04-07, showing the overall site configuration.
4. "Plan and Profile, 12 inch Propane Pipeline, Carmichael Station to Stopper Plug, Carmichael, Mississippi", dated 11-04-07, showing the rupture site configuration.

The above map data indicated a cluster of six residential dwellings was located in an area commencing about 512 feet to the southwest of the rupture site.

A copy of the above-described map compiled by the engineering survey contractor is anticipated to be available in the NTSB public docket, as a separate document to this report.

b. Mississippi Highway Patrol / C.R.A.S.H. Team

The Mississippi Highway Patrol responded their C.R.A.S.H. Team resource to the site, which compiled a report (comprised of a series of five documents) to describe the accident site, which are identified as follows.

[79] address: P. O. Box 15369, Hattiesburg, MS 39404, and [Internet] >> http://www.env-mgt.com/
[80] all four maps are referenced as Environmental Mapping Services project # 07H094

Item Title / Description

1. "MHP C.R.A.S.H Team Report, Case Number AR32-071101-45, Location: Community of Carmichael, Mississippi", dated Nov. 07, 2007, which provides the report narrative content.
2. as an Appendix to Item 1, a diagram (site survey sheet) showing the entire affected area (overall scene).
3. as an Appendix to Item 1, "Inset A" to Item 2: a diagram (site survey sheet) showing the location of pipeline and major affected area.
4. as an Appendix to Item 1, "Inset B" to Item 2: a diagram (site survey sheet) showing the location configuration of the four burned-out residential dwellings and vehicles, and fatalities.
5. as an Appendix to Item 1, Measurement Data Log for the diagrams (site survey sheets) presented in the report.

A copy of the above-described report, compiled by the Mississippi Highway Patrol - C.R.A.S.H Team, is anticipated to be available in the NTSB public docket, as a separate document to this report.

5.4.2 Photo Documentation of the Accident Site

Photographs of the accident site (described in this report) were taken by the Survival Factors investigation (i.e. by Safety Board staff, as well as principals of the Parties to the Investigation), selected images of which are to be provided in a separate Addendum to the Survival Factors Factual Report of the Investigation.

6.0 Emergency Response – Agencies / Organizations - Summary Background

6.1 Local Jurisdiction - Definition

The accident occurred within the unincorporated community of Carmichael, MS, which is located in Clarke County. The community of Carmichael is within the emergency response jurisdiction for fire / rescue services of the Carmichael Volunteer Fire Department (CVFD), which provided the fire / rescue - emergency response to the event (as further described in this report; see § 6.2), as supported by local fire / rescue Mutual Aid resources. Law enforcement for the community of Carmichael is within the jurisdiction of the Clarke County Sheriff Department, as supported by local law enforcement Mutual Aid resources (as further described in this report; see § 6.7). Communications for emergency services resources of Clarke County (i.e. county 9-1-1, county fire / rescue, county law enforcement, county EMS [ambulance]) is provided by the Clarke County Communications [agency] (as further described in this report; see § 6.8).

6.1.1 Civil Infrastructure / Population Approximation[81]

[81] source: CVFD and Clarke County Emergency Management Agency

Principals of local emergency response agencies indicated there were an estimated 60 residential dwellings located within a one-mile (evacuation) radius of the accident site, containing an estimated population count of about 200 resident individuals[82]. Other than a few commercially operated poultry hatchery / egg production, or related facilities[83], which have a relative few employees[84], there are no other commercial establishments proximate to (i.e. within a one-mile radius of) the accident site.

6.1.2 Other Communities Affected by the Event

The aftermath of the accident (i.e. the precautionary evacuations) did not substantially affect peripheral communities outside of the evacuation zone, other than some resulting vehicular traffic detours, and some traffic congestion, in the areas immediately proximate to the evacuation zone.

6.2 Principal Responding Jurisdictional Fire / Rescue Agency

The Carmichael Volunteer Fire Department (CVFD) is the principal emergency services [fire / rescue] agency responsible for responding to fire suppression, emergency rescue, and an initial response to hazardous materials incidents within the community of Carmichael, and was the initial fire / rescue agency that responded to the scene in this incident, as further described in this report. The CVFD also provides medical response support to the primary emergency medical service response (ambulance) agency for the jurisdiction[85].

6.2.1 Summary Background[86]

The CVFD is a fully volunteer constituency, fire / rescue - emergency services operation, which presently[87] consists of 17 active (fully-trained / qualified) members. The CVFD, which provides fire / rescue protection for a jurisdiction of about 38 sq. miles, was initially organized in 1976. The CVFD presently operates out of one fire station[88], which is located in an unincorporated locality of Clarke County[89]. The CVFD [fire / rescue operations] is under the command of the Chief of the Fire Department[90], who is supported by an Assistant Chief, several command officers and operational firefighting personnel, with ancillary commissary support operations provided by a Ladies Auxiliary. The CVFD operating firefighting and rescue [vehicle] apparatus roster basically consists of three tactical response vehicles (one pumper / engine [1994], and two

[82] population estimate available only (U.S. Census does not report data for this jurisdiction).
[83] a poultry raising operation, principally comprised of large, barn-like structures, known locally as “chicken houses”
[84] such poultry operations might typically have only three or four staff (individuals) at the facility at any given time.
[85] primary emergency medical service [ambulance] response in Clarke County is provided by a private contractor (Paratech Emergency Medical Services), with CVFD providing response support to that role (as further described in this report; see § 6.4)
[86] source - CVFD Chief of the Department (on-scene, and subsequent interviews), and other sources as noted, utilizing generally November 2007 data.
[87] all contemporaneous references, in this context, refer to the timeframe of the accident
[88] the CVFD fire station is located about 4.1 miles [linear] to the northwest of the accident site, which was measured [as simulated by the investigation] to be about 6 minutes driving time for responding a fire truck.
[89] the CVFD fire station has a Shubuta, MS, mailing address (USPS)
[90] who is also the designated Party representative to the Survival Factors Working Group.

tanker trucks [1986 and 1990]), in which also the individual firefighting personnel are able to respond to fire-calls in their privately owned vehicles (POV's).

The CVFD maintains a formal / documented Mutual Aid Agreement with several constituent municipal / jurisdictional emergency response agencies / organizations within Clarke County, and neighboring counties.

Telephone requests for emergency services (e.g. fire /rescue, police, EMS, etc.) in Clarke County, as placed via the Clarke County "9-1-1 System", are received by the Clarke County Communications [agency], which operates the 9-1-1 Emergency Call Center / Central Dispatch (as further described in this report; see § 6.8), which also provides the dispatching of [requested] emergency services resources, and some mutual aid resources. Also, responsive to a request for CVFD emergency services resources that has been placed directly to [personnel of] the CVFD, or upon [personnel of] the CVFD receiving information about an event in which it would be reasonable and prudent to dispatch CVFD emergency services resources, the CVFD may also directly dispatch emergency services resources, as directed by Command Officers of the organization.

Several of the CVFD firefighting personnel are Emergency Medical Technician (EMT) qualified, where also the CVFD responds simultaneously to ambulance dispatch runs, to provide response support for most ambulance service activities.

Historically, the CVFD responds to about 100 fire / rescue emergency, and ambulance support, incidents annually (inclusive of fire-calls [all varieties], mutual aid response, false alarms, vehicle highway accident response, etc.). The CVFD represented to the Investigation that their organization, as a rural-based, volunteer firefighting institution, adheres to, or are in compliance with, all NFPA[91] technical performance and operational Guides, Standards and Recommended Practices that may be applicable to their organization. The CVFD has been assessed [for their emergency services jurisdiction] a Class 8 fire protection rating by the Mississippi State Rating Bureau[92].

Training for CVFD firefighter service personnel was represented (by CVFD Operations management) as being in accordance with applicable OSHA requirements[93], and some of the CVFD firefighter service personnel (who perform Operational duties[94]) have been certified to the effective equivalent of a Firefighter I level[95], or higher training level (for their duty assignment).

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[91] National Fire Protection Association (see Select Acronym Nomenclature / Abbreviations, located subsequent to the Table of Contents of this report).
[92] see [Internet] http://www.msratingbureau.com/index.htm
[93] Occupational Safety and Health Administration (an agency of the U.S. Department of Labor), pursuant to 49 CFR 1910.120
[94] the exception to this criteria are Probationary Members, who's operational duties are limited in scope, pursuant to CVFD Standard Operating Procedures.
[95] as defined in NFPA 1001: Standard for Fire Fighter Professional Qualifications; identifies the minimum job performance requirements for … career and volunteer fire fighters [National Fire Protection Association, Quincy, MA 02269].

The CVFD works closely with the Clarke County Emergency Management Agency relative to Emergency Preparedness Plans, mass casualty Incident Command protocols, as well as training and drill exercises / preparedness activities. Training exercises are also routinely / periodically conducted with the local mutual aid emergency services organizations, as organized by the CVFD as well as through Clarke County Emergency Management (as further described in this report; see § 6.3).

6.2.2 CVFD Preparedness Measures / Response Execution Plans

The CVFD does not maintain a formal / documented - Preparedness / Emergency Response Execution Plan, per se, but instead utilizes and conforms to the formal / documented Clarke County Comprehensive Emergency Management Plan, as developed and promulgated by the Clarke County Emergency Management Agency (as further described in this report; see § 6.3).

In addition to the above [Comprehensive Emergency Management Plan], the CVFD maintains a series of formal / documented Regulations and Standard Operating Procedures (Regulations / SOP's) that govern most of the routine CVFD fire / rescue, and related emergency services operations. As a brief summarization of the informational content of the CVFD – Regulations / SOP's, a copy of the Table of Contents of that document[96] is provided in Exhibit 8.

6.2.3 Pipeline Incident Preparedness Training Conducted Prior to the Event

The CVFD reported to the investigation that they had not conducted "formal / hands-on" pipeline [equipment and operations] familiarization / preparedness training with Dixie / Enterprise Products in the recent time period (approximately 5 years) prior to the accident. However, in lieu of that, principals of the CVFD represented to the investigation that:

- all CVFD firefighting operations personnel have a basic familiarization of the [Dixie / Enterprise Products] propane pipeline operation in their jurisdiction, and
- CVFD has conducted many live-fire drills (over the past several years) involving the release / ignition of relatively small quantities of propane gas (i.e. small, residential-size propane storage tanks), such that CVFD firefighting operations personnel have a good working-knowledge of how to safely / effectively / efficiently suppress a relatively small propane fire, and
- CVFD had received a quantity of training materials [a pamphlet / folder] from Dixie / Enterprise Products, titled "A Guideline for Emergency Response Agencies" (as further described in this report; see § 6.9.1.m), which many CVFD firefighting operations personnel have had an opportunity to review / become familiar with, and
- that many CVFD firefighting operations personnel had a reasonably sufficient familiarization, and a good 'working knowledge' of fire suppression response procedures involving a sizable release of a flammable gas (in this case propane), such that the bulk of CVFD firefighters were able to safely, efficiently, and effectively execute search and rescue, and perform, to the extent possible, fire suppression operations of the residential structures that ignited and burned (as a result of the explosive ignition of [propane]

[96] provided as exemplar demonstration of the overall depth and comprehensiveness of the document.

product), with appropriate attention to safety, expediency, and diligence, to where not having formalized / hands-on pipeline familiarization training was seen an impediment, or resulted in an unwarranted risk to their personnel, or the civilian population, in this event, and

- CVFD firefighting operations Senior Command Officers[97] were very familiar with, and routinely made use of, the Emergency Response Guidebook[98], which provides basic guidance on how to handle an unintended release of potentially dangerous / hazardous cargo substances being transported in the pipelines that traverse their fire protection jurisdiction, and
- principals of the CVFD represented that they will endeavor to incorporate more simulated "table-top" tactical response drills involving the release / ignition of propane gas from a pipeline in upcoming preparedness training sessions, and
- CVFD personnel had attended several of the "Government Liaison - Emergency Response Program" emergency responder familiarization events that had been held in Meridian, MS (as further described in this report; see § 6.9.4.b), and had received a copy of the two publications titled "The Pipeline Group® Emergency Response Manual" and a "General Information Guide to a Pipeline Emergency", as distributed to, and supportive of, emergency response agency attendance at the Government Liaison - Emergency Response Program emergency responder familiarization events (as further described in this report; see § 6.9.1.h).
- CVFD would welcome participation in "formal / hands-on" pipeline [equipment and operations] familiarization / preparedness training with Dixie / Enterprise Products (or a designated technical contractor) as might be conducted at a venue proximate to the community of Carmichael.

6.2.4 Actions Consequential to the Accident

The CVFD reported to the investigation that aside from the consumption of routine operational supplies (e.g. diesel fuel, work gloves, etc.) and the inadvertent misplacement of some incidental operational equipment (e.g. hose fittings, etc.), all of which was subsequently located or replaced, no adverse actions or consequences were experienced by this organization as a result of the event.

6.3 Jurisdictional Emergency Management Agency

The Clarke County Emergency Management Agency was the jurisdictional emergency management agency in this incident, which also responded personnel and resources to support the incident. Clarke County Emergency Management, which is an agency of the Clarke County government, as governed by the Clarke County Board of Supervisors[99], has the responsibility of compiling and maintaining a formal / documented emergency preparedness and response action

[97] e.g. Chief of the Department, Assistant Chief, Captains, etc.
[98] ref. U.S.D.O.T. / Transport Canada / Secretariat of Transport and Communications of Mexico; 2004 Emergency Response Guidebook (see [Internet] http://hazmat.dot.gov/pubs/erg/gydebook.htm)
[99] ref., and for further information, see [Internet] http://www.clarkecountybos.com/

plan, and is a resource available to provide logistics and technical resources support in the event of a civil emergency or mass casualty incident.

6.3.1 Emergency Preparedness / Response Operations Plan

The Clarke County Emergency Management Agency has compiled and maintains a formal / documented Preparedness Plan titled the "Clarke County Comprehensive Emergency Management Plan", [dated / revised] October 2006.

The emergency management Plan is produced in coordination with the Mississippi [State] Emergency Management Agency and the U.S. Department of Homeland Security. The Plan is also produced in accordance with the National Response Plan (NRP), is National Incident Management System (NIMS) compliant, and is produced in conjunction with the Clarke County Local Emergency Planning Committee (LEPC), as further described in this report (see § 6.3.3). The Clarke County Comprehensive Emergency Management Plan is promulgated pursuant to the requirements stipulated under Presidential Executive Order 11795, Mississippi Emergency Management Law of 1995 as codified at Title 33, Chapter 15 of the Mississippi Code of 1972, Annotated[100], the National Response Plan, and Presidential Homeland Security Directives 1-12.

The Emergency Operations Plan (available as a printed document, and in digital [CD] format) is scheduled for periodic update, and is distributed to all of the emergency response / emergency services agencies in Clarke County.

As a brief summarization of the informational content of the Clarke County Comprehensive Emergency Management Plan, a copy of the Table of Contents of that document[101] is provided in Exhibit 9.

6.3.2 Emergency Operations Center

As a resource available for use by Clarke County emergency services agencies, and supporting mutual aid and other responding agencies and/or organizations during civil emergencies, Clarke County Emergency Management maintains an Emergency Operations Center (EOC) facility, which is located in the City of Quitman.

6.3.3 Role of the Local Emergency Planning Committee[102]

As a general description, the Local Emergency Planning Committee (LEPC) is a committee appointed by a State Emergency Response Commission, as required by SARA Title III, which is specifically responsible for formulating a comprehensive emergency plan for its region, and is the coordinating point for both planning and training activities at the local level. Participants of an LEPC include, for example, elected and state officials, fire police departments, emergency management, public health, and private industries, and industry personnel (of those private

[100] see [Internet] http://michie.com/mississippi/lpext.dll?f=templates&fn=main-h.htm&cp=
[101] provided as exemplar demonstration of the overall depth and comprehensiveness of the document.
[102] ref. Noll, G. G., Hildebrand, M. S., Yvorra, J. G., Hazardous Materials - Managing the Incident 2nd Ed., Fire Protection Publications, Oklahoma State University. 1995, pgs 12, 520.

industries that maintain a hazardous materials presence), among other participatory organizations. In summary, its specific responsibilities include:

- Develop, and periodically test and exercise a Hazardous Materials Action Plan.
- Conduct a hazards analysis of hazardous materials facilities and transportation corridors.
- Receive and manage hazardous materials facility reporting information.
- Coordinate community Right-to-Know aspects of SARA III.

6.4 Responding Jurisdictional Emergency Medical Service Provider(s)

Emergency medical service (EMS / ambulance) response in Clarke County is provided by a private contractor by the name of Paratech Emergency Medical Services, which is located in Quitman, MS, which is normally dispatched by the 9-1-1 Emergency Call Center / Central Dispatch. A secondary EMS / ambulance provider by the name of Wayne General EMS (located in Waynesboro, MS) is available as a 'mutual aid' response resource (which normally would be dispatched to an EMS call by Wayne County's [emergency services] Dispatch agency).

Both EMS agencies responded resources to the scene, the activities of which are briefly summarized as follows.

- Paratech EMS dispatched one ambulance with a crew of two EMS personnel to the scene, in which no patients were transported by this organization to any medical facilities. This agency treated one patient on-scene for a minor [arm] burn injury (which occurred shortly after their on-scene arrival), where the patient indicated that he would seek further medical attention on his own. Resources of this organization rotated in / out of the scene (on a precautionary 'stand-by' basis) for the duration of the on-scene emergency services presence (about 12 days).
- Wayne General EMS dispatched one ambulance with a crew of two EMS personnel to the scene, which essentially rotated in / out of the scene (on a precautionary 'stand-by' basis) for the duration of the on-scene emergency services presence (about 12 days), in which no patients were treated (on-scene) or transported by this organization to any medical facilities.

6.5 Hazardous Material Incidents – Principal Responding Jurisdictional Agency[103]

The jurisdictional organization that is available to respond to (i.e. responsible for technically addressing) hazardous material incidents in Clarke County is the Southeast 2 Regional Response Team[104]. Additional tactical response support to hazardous material incidents in Clarke County is provided by the Clarke County Emergency Management Agency. Hazardous material incidents that are anticipated to potentially have a substantial impact on the environment are to be reported to the Mississippi Department of Environmental Quality's Pollution Control Division (MDEQ), which is a MS state agency that can make additional tactical response support resources available to Clarke County.

[103] source: CVFD; on-scene, and post-scene interviews, and as noted otherwise.
[104] a jurisdictional contingent of the Mississippi Office of Homeland Security (which is a "multi-agency task force" [operation] of the State of Mississippi), as described in [Internet] http://www.homelandsecurity.ms.gov/

6.6 Mutual Aid - Fire / Rescue Support to the Incident

As previously noted in this report, the CVFD maintains a formal / documented Mutual Aid Agreement with several constituent municipal / jurisdictional emergency response agencies / organizations within Clarke, and neighboring Counties. As a brief summarization, jurisdictions that provided mutual aid fire / rescue support to the incident included, but was not limited to, the following organizations[105].

6.6.1 Fire / Rescue Support

Mutual Aid fire / rescue support to the incident from other localities in Clarke County included the communities of Theadville, and Desoto, and the Cities of Shubuta and Quitman. Response support from other localities outside of Clarke County included Wayne County volunteer fire department resources (i.e. Matherville), and the City of Waynesboro, along with resources of Newton, Jasper, and Jones Counties [all in Mississippi], and Choctaw County [Alabama].

6.6.2 Mississippi State Forestry Commission[106]

The State of Mississippi maintains an agency by the name of the Mississippi State Forestry Commission, which is entrusted with protection of the State's forestry assets, which includes resources to execute forest fire suppression / mitigation. The Forestry Commission was requested to respond firefighting resources to the scene, which successfully suppressed the woodlands and grassland fire proximate to the pipeline rupture site (i.e. those areas which had not already 'self-extinguished'). The Forestry Commission staff estimated the fire-damaged woodlands and grassland area to be about 71.4 acres (as further noted in this report). A brief summary of the firefighting response provided by the Forestry Commission is included in the Timeline documentation of the incident (as further described in this report; see § 7.1).

6.7 Responding Law Enforcement Agencies[107]

The accident occurred in an unincorporated jurisdiction within Clarke County. Law enforcement services for such unincorporated jurisdictions are provided by the Clarke County Sheriff Department, which is the primary law enforcement agency for unincorporated jurisdictions within Clarke County, as supported by additional responding law enforcement resources as might be available from the State (e.g. Mississippi Highway Patrol), adjacent counties, and incorporated jurisdictions within Clarke County, or adjacent counties, that have their own municipal police agencies (e.g. City of Meridian).

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[105] although it is recognized that all of the responding emergency services agencies and supporting organizations, and responding governmental agencies, made a significant contribution to the emergency response / hazmat mitigation / investigation effort, due to space limitations, only a limited number of Fire / Rescue organizations are cited in this section of the report. A complete list of responding agencies is provided in Exhibit 13 of this report.
[106] source: NTSB Survival Factors staff interviews with MS State Forestry Commission staff, and documentation of the organization, with select background from [Internet] http://www.mfc.state.ms.us/
[107] source: principals of the individual jurisdictional police agencies cited.

Police agency response in this incident was provided by the Clarke County Sheriff Department, and additional responding law enforcement resources of other jurisdictions, the activities of which are further briefly summarized as follows[108].

6.7.1 Jurisdictional Law Enforcement - Clarke County Sheriff Department

The Clarke County Sheriff Department responded resources to the accident scene, the activities of which principally consisted of Incident Command, providing initial search and research support, establishing and maintaining roadway blockades, assisting in the evacuation process, and providing daily security to the evacuated residences and (the one) business within the evacuation zone, until the evacuation had terminated, as further described in this report.

6.7.2 State Law Enforcement - Mutual Aid Support

In this incident, as a brief summary, the Mississippi Highway Patrol responded mutual aid police resources to the accident scene, which consisted principally of the establishment of roadway blockades and assisting in the evacuation efforts. The Mississippi Highway Patrol also responded their C.R.A.S.H. Team resource to the site, which compiled a survey map of the accident scene (as further described in this report; see § 5.4.1.b).

6.7.3 Other Law Enforcement - Mutual Aid Support

Within Clarke County, as well as other counties in southern MS, there are a number of incorporated jurisdictions that have their own municipal police agencies, as well as county Sheriff Departments, which are available for responding to law enforcement, public emergency (other than medical or fire / hazardous materials), or security related incidents within those jurisdictional communities, in which also the resources are available to respond to neighboring jurisdictions as well, as mutual aid support.

As a brief summary, in this incident, the jurisdictions of the Wayne County (Sheriff's Department), Choctaw County (Sheriff's Department), City of Meridian (Police Department), the Alabama State Police, and several other incorporated jurisdictions that have their own municipal police agencies, and other counties proximate to Clarke county, responded mutual aid police resources to the accident scene, which consisted principally of the establishment of roadway blockades and assisting in the evacuation efforts.

Also, the following agencies responded specialized vehicle resources to the site, which included technical personnel, and purpose-built Mobile Tactical Command vehicles (i.e. Incident Command motor coaches / trailers), which were utilized by Incident Command and technical support personnel (of several agencies) during the on-scene phase of the emergency response to the incident:

- City of Meridian, MS

[108] although it is recognized that all of the responding law enforcement agencies and supporting organizations, and responding governmental agencies, made a significant contribution to the emergency response effort, due to space limitations, only a limited number of law enforcement agencies are cited in this section of the report, where also, a complete list of responding agencies is provided in Exhibit 13 of this report.

- Mississippi Emergency Management Agency (MEMA)
- Newton County, MS
- Southeast 2 Regional Response Team[109]

6.8 Clarke County - Emergency Services Communications[110]

Communications for emergency services resources of Clarke County (i.e. all fire / rescue, police, EMS [ambulance], Emergency Management, etc.) is performed by the Clarke County Communications [agency], which is essentially comprised of the Clarke County 9-1-1 Emergency Call Center / Central Dispatch facility (referred to hereafter in this report section as E911 / Central Dispatch)[111]. The agency, which is located at the County Courthouse in the City of Quitman, is governed by, and is comprised within the domain and responsibility of, the Clarke County Board of Supervisors[112]. Activities and substantive elements of the Clarke County – E911 / Dispatch operation, as relative to the investigation, are briefly summarized as follows.

6.8.1 9-1-1 Emergency Call Processing / Resource Dispatch Services

a. Telephone requests for emergency services in Clarke County, as placed via the Clarke County "9-1-1 System", are received and processed by E911 / Central Dispatch according to established procedures for emergency services requests for fire / rescue, law enforcement [police], EMS Dispatch calls, or other calls for emergency services or public services (e.g. Animal Control, County Coroner, etc.). Responsive to those requests for emergency services, E911 / Central Dispatch then "manually" performs initial dispatching of Clarke County emergency services resources (all fire / rescue, police, EMS, etc.). As occurred in this event, this included the (attempted) initial dispatch of fire / rescue and police resources, and subsequent dispatch of mutual aid resources (as further described in this report; see § 7.2, and § 7.3).

b. Procedurally, for fire / rescue operations, responsive to a 9-1-1 [call] request for emergency services, initial Dispatching of emergency services resources by E911 / Central Dispatch is by placing a 'Dispatch Page' message, via the Fire Department [fire / rescue] radio channel, to the appropriate jurisdictional fire / rescue agency (i.e. the individual community fire departments proximate to the location of the reported event). Information about the request for emergency services (i.e. site location, type of call, etc.) is then orally relayed to personnel of the fire / rescue agency using a conventional Service Radio[113], as fitted to the individual firefighting apparatus vehicles (fire trucks, etc.), fire department hand-held Service

[109] as further described in this report; see § 6.5.
[110] source: on-scene and subsequent interviews with, and correspondence with / documentation supplied by, the Director of the Clarke County Communications Center, and other authoritative sources, as noted.
[111] such a facility / operation is also referred to as a Public Safety Answering Point (PSAP), as further described in [Internet] http://www.nena.org/
[112] ref., and for further information, see [Internet] http://www.clarkecountybos.com/
[113] such equipment is technically referred to as a 'radio transceiver', which is capable of transmitting the Dispatcher's voice to radio signal receiving equipment at a distant location, in which also the receiver's voice is capable of being transmitted back to Dispatcher's signal receiving equipment.

Radios[114], and/or "base-station" radio units (e.g. located in fire stations). The jurisdictional fire / rescue agency then orally responds (back to E911 / Central Dispatch) with an indication that they are responding apparatus (e.g. fire trucks, etc.) and/or personnel to the scene of the emergency services response request, as appropriate to the type of response request. A similar Dispatch procedure, as described above for fire / rescue, is also employed for law enforcement [police], EMS, or other emergency services agencies, which is further described (below) in this report Section.

c. As previously described (in § 6.8.1.b of this report), normal practice [standard operating procedure] for the Dispatch of Clarke County emergency services would be that upon placement by E911 / Central Dispatch of a radio dispatch Page (i.e. request to respond), the responding [fire / rescue] agency would reply an acknowledgement back to E911 / Central Dispatch, indicating a response was proceeding as requested, although (it's been historically demonstrated that) such an acknowledgement back to E911 / Central Dispatch might typically require up to several minutes to occur, due to the voluntary structure of many of the Clarke County emergency services agencies / organizations. Hence, when a response acknowledgement to an initial radio dispatch Page to the primary jurisdictional fire / rescue agency is not immediately received (within a reasonable time interval), this means that no volunteers were available to respond, and that a 'back-up' fire / rescue agency would need to be summoned to provide a response to the call. Typically, such a 'back-up' fire / rescue agency is summoned from a neighboring fire protection jurisdiction, which because of its close proximity, would be able to provide a reasonably expedient response to the call.

   Consequently, in consideration of the above, standard operating procedure for Clarke County – E911 / Central Dispatch prescribes that upon not receiving a radio acknowledgement response from the primary jurisdictional fire / rescue agency to an initial dispatch Page within approximately a two-minute time interval from when initially transmitted (affirming that the initial message had been received and that a response was in progress), that a subsequent radio dispatch Page would then be placed to a secondary [back-up] responding fire / rescue agency proximate to that jurisdiction (i.e. typically from a neighboring jurisdiction). Further, if the secondary [back-up] responding agency doesn't respond accordingly to a dispatch Page within approximately a two-minute time interval from when initially transmitted, a radio dispatch Page would then be placed to a tertiary [3rd level] 'back-up' responding agency (again, typically from another neighboring jurisdiction), and so forth, until a response acknowledgement from a fire / rescue agency is received, affirming that the dispatch Page message had been received and that a response was in progress.

d. For Clarke County fire / rescue agencies, some subsequent (secondary) dispatching of emergency services resources is performed by the respective jurisdictional [community] fire / rescue agencies utilizing their individual Service Radio equipment, or other communications resources (e.g. cellular telephones, hand-held service radios, etc.). Also, the jurisdictional fire / rescue agencies may directly Dispatch their own emergency services resources to an event that necessitates such a Dispatch, without first being dispatched by E911 / Central

[114] as a general observation, hand-held service radios have a somewhat limited transmission range, although they can communicate directly with other hand-held radios (located relatively nearby), as well as a "base-station" radio unit (as might be located at a fire station, or the County Communication Center).

Dispatch. The jurisdictional fire / rescue agencies are required to alert E911 / Central Dispatch should they directly Dispatch their own resources to such an event[115], such to make E911 / Central Dispatch aware of that dispatch activity, where accordingly, should a simultaneous or subsequent event occur (in that same jurisdiction) which requires a fire / rescue response in which also the jurisdictional fire / rescue agency is unavailable or unable to handle, E911 / Central Dispatch can correspondingly summons 'back-up' response support from a 'mutual aid' fire / rescue agency (typically from a neighboring jurisdiction) to address the simultaneous or subsequent event.

e. The Clarke County – E911 / Central Dispatch does not have a "Computer Aided Dispatch" ("CAD") system[116]. Basically described, such a system, which is incorporated into the 'call-processing [computer based] communications console' of an emergency services dispatching agency [117], helps to efficiently / effectively manage (via computer based automation) the active [real-time], or archived, call processing / Dispatch 'information display' activity data, and automates the subsequent data recording process. Correspondingly, the activity data for an emergency services dispatching agency that does not have such a system must be "manually" recorded by the operating personnel performing the Dispatching duties, in order to be efficiently / effectively managed (as further described in this report; see § 6.8.2.b). Relative to this, E911 / Central Dispatch also indicated to the investigation that prior procurement of a CAD system was not seen as a pressing necessity by the agency, as there had not been a *demonstrated need* for such specialized equipment, given the level of operational activity of their agency (involving 9-1-1 call processing / emergency services Radio Dispatch) for a typical workday, the purchase of which was also a significant budgetary consideration for the agency [118].

f. The Clarke County – E911 / Central Dispatch does not have a "Reverse 9-1-1 Emergency Notification System" capability[119].

g. Clarke County – E911 / Central Dispatch characterized their operation as not a particularly busy facility (relative to rural, correspondingly dense [population], county-level, emergency

[115] i.e. referred to as a "10-8" radio message

[116] as a basic description (as sourced from several manufacturers of these systems), a "CAD" system is a method of dispatching emergency services, as assisted by a computer-based support system (which utilizes a Server computer and integrated corresponding CAD software), to transmit messages to the dispatch recipient(s) in the field, and/or to manage (store and retrieve) the archived Dispatch data (encoded in the computer system as a 'dispatch code' and/or a text message), which (as compared to "manual" Dispatching operations) affords a more efficient and effective management of the Dispatching process by allowing the Dispatch [operating] personnel to readily view the status of dispatched resources, and to be able to readily retrieve archived data (for analytical, and/or historical-use purposes).

[117] as further described in this report; see § 6.8.4.

[118] an inquiry placed to the technical maintenance service contractor of the E911 / Central Dispatch [Service Radio] communication system into the cost of a CAD system (as might be applicable to the Clarke County – E911 / Central Dispatch operation) identified that such equipment is priced in the range of about $150,000.

[119] as a basic description (as sourced from several manufacturers of this equipment), a Reverse 911 Emergency Notification System is an 'interactive community notification' system, which essentially incorporates an automated telephone dialing process that can be programmed with [a sizable quantity of] telephone numbers of the constituent population (within a specified jurisdiction), that when activated, dials the pre-programmed telephone numbers in the database, and upon answering by the telephone customer (lifting of the handset / receiver), delivers a prerecorded audio message.

call center / radio dispatch operations), where the level of 9-1-1 call processing / Dispatch radio activity on a typical operational workday might involve about three or four county-wide requests for fire / rescue emergency services (of all kinds), about 10 or so (daytime) radio transmissions per hour to/from law enforcement personnel (principally Sheriff Deputies) involving all routine activities, and about four or five county-wide requests for EMS [ambulance] services (of all kinds) per day. The above workload is in addition to possibly one or two non-emergency / administrative-type calls per hour that might be processed (e.g. a query as to which specific County agency to contact to address a particular question or public service), which usually occurs only during daytime hours. Accordingly, the degree of workload is not normally perceived as overbearing for the normal level of operational personnel that staff the facility, which is typically two qualified individuals (at a minimum) plus an operational supervisor (usually only daytime hours, who is also fully-qualified to perform all operational duties), with additional qualified personnel available to be called-in as might be needed to handle additional workload as might result from unusual events (either scheduled, or as might randomly occur).

h. Standard operating practices and procedures for the operation of an emergency services communications facility have been compiled in internationally recognized 'professional code of best-practices' documents, titled "Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems, 2007 Edition" (also referred to as NFPA 1221), and "Standard for Professional Qualifications for Public Safety Telecommunicator" (also referred to as NFPA 1061)[120], the compliance criteria of which many emergency services communications agencies have elected to voluntarily adopt. Corresponding to this, Clarke County – E911 / Central Dispatch represented to the Investigation that their agency substantially adheres to, or is in material compliance with, all applicable technical performance elements of NFPA 1221 and NFPA 1061, to the extent possible.

6.8.2 Recording Capability – 9-1-1 Calls and Police / Fire / Ambulance Dispatch Radio Channels

a. Clarke County – E911 / Central Dispatch maintains an automatic audio recording capability of all 9-1-1 telephone calls, all fire / rescue, police, EMS - Dispatch radio channels, and some of their non-emergency (administrative) telephone lines. The audio content of other communications devices used by emergency services personnel (e.g. cellular telephones, many of which incorporated a SouthernLINC Wireless® communication feature[121]), and certain Service Radio channels (e.g. used by some handheld portable radios), is not recorded by the agency.

b. A brief hand-written notation of 911 telephone calls and emergency services Dispatch activities is also manually recorded by E911 / Central Dispatch personnel in a Radio Station Log Sheet, a copy of which is individually compiled / maintained by each of the E911 / Central Dispatch operating personnel. In the event that E911 / Central Dispatch receives an

[120] ref. National Fire Protection Association (NFPA), which is an international nonprofit organization, which produces and advocates scientifically-based consensus codes and standards, many of which have been adopted as a required safety standard by various municipal and jurisdictional authorities (see [Internet]: http://www.nfpa.org).
[121] as further described in this report; see § 6.8.6.a.

unusually large incoming 9-1-1 call volume and/or E911 / Central Dispatch personnel become involved in a multitude of exigent emergency services Dispatch activities (both as occurred in this event), not all of the dispatch activities might be contemporaneously logged [manually recorded] into the Radio Station Log Sheet(s) as they occur, where also, E911 / Central Dispatch personnel will subsequently perform "late entry" notations in the Radio Station Log Sheet(s), to the extent possible. Also, in such situations as an unusually large 9-1-1 call volume / exigent Dispatch activities (which was indicated rarely occurs), where the focus of E911 / Central Dispatch operating personnel is on efficiently / accurately processing 9-1-1 calls and executing exigent Dispatch activities, rather than performing deferrable administrative functions (i.e. making Log Sheet notations), such contemporaneous, or even "late entry" notations in the Radio Station Log Sheet(s), for what might be deemed (at that time) as somewhat inconsequential telephone calls (both 911, and admin / non-emergency telephone lines) or dispatch activities, might be inadvertently omitted from the Radio Station Log Sheet(s), in that the content of such inadvertently omitted notations can normally be recovered from the automatic audio recording system, if that information is subsequently needed to be documented by the E911 / Central Dispatch personnel. Further, in rare cases, the content of telephone, and/or radio Dispatch calls that are made on non-recorded lines, or other means of non-recorded communications (e.g. cell phones, SouthernLINC Wireless®), are reconstructed by E911 / Central Dispatch operating personnel, to the extent possible, on a 'best-recollection' / 'good-faith' effort basis.

6.8.3 'Time-stamp' Agreement with USNO Time Standard[122]

The audio recording system clock of the Clarke County – E911 / Central Dispatch, which is utilized as a source for the 'time-stamp' function of the 9-1-1 Emergency Call Center and emergency response Dispatch [service radio] communications - call data archive system and Log Sheet [hand-written notation] documentation, was identified by the investigation to register a time reading that was behind (i.e. slower than) the USNO Master Clock Time[123, 124] by 2 minutes 15 seconds[125].

The identified [-02:15] 'time-stamp' discrepancy was positively reconciled (adjusted forward a commensurate amount) by the Investigation, such to reflect the correct USNO Time Standard in audio recordings that were identified / utilized by the investigation, and to allow a consistent comparison of 'time-stamp' data between time reporting entities.

6.8.4 Fire Department [fire / rescue] Communications

The Clarke County – E911 / Central Dispatch utilizes a conventional Service Radio Communication System for routine mobile communications with the constituent emergency services agencies of the County, which includes the local (community) / jurisdictional Fire

[122] ref., and for further information, see [Internet] http://tycho.usno.navy.mil/frontpage.html
[123] i.e. Official Time Standard of the United States; ref., and for Official Time, see [Internet] http://www.time.gov/
[124] USNO Master Clock Time is related to the Coordinated Universal Time standard (i.e. UTC, ref. [Internet] http://aa.usno.navy.mil/faq/docs/UT.php, or http://tycho.usno.navy.mil/systime.html)
[125] Time validation was by visual comparison of the agency's system clock against the USNO Official Time, as performed by the Survival Factors Group Chairperson, as affirmed by SF Group Party to the Investigation participants present when the comparison occurred (on 03 Nov. 2007).

Department agencies, the Sheriff Department, among other agencies. Basically described (at the time of the event), the Clarke County Radio Communication System was comprised of a 'call-processing [computer based] communications console [126] (which is located at the E911 / Central Dispatch facility) to receive / monitor 9-1-1 calls and to transmit / receive Service Radio communications to the emergency services agencies of the county, 'remote computer servers' equipment (which is located at the Clarke County Jail) which support the call-processing [computer based] communications console equipment, a radio signal 'main transmitter' unit[127], and radio signal "repeater system" equipment (which is remotely located at the transmitter / receiver communications tower facility[128]).

A radio signal "repeater system"[129] is utilized by E911 / Central Dispatch because of a somewhat limited radio signal transmission range of the Service Radio 'main transmitter' unit, and the overall geographic size of the service radio coverage that is needed. Separate radio signal "repeater system" transmitter units are employed for the transmission of Fire Department [fire / rescue] radio signal communications, and the Sheriff Department radio signal communications, where also, the fire / rescue Service Radios operate on a separate radio frequency to that of the Sheriff Department.

Clarke County's Service Radio Communication System, which (as noted) includes the [fire / rescue and Sheriff Department] radio signal "repeater system" equipment, is maintained, through a commercial arrangement, utilizing the professional services of a technical maintenance service contractor[130]. As currently configured, E911 / Central Dispatch does not have the capability to continuously monitor radio signal continuity between the call-processing [computer based] communications console and the remotely located radio signal "repeater system" equipment[131].

The radio signal "repeater system" equipment currently in use was installed (new) in June 2007, where (since installation, until November 1, 2007) no system malfunctions or performance failures had occurred. The prior radio signal "repeater system" equipment was installed in 1994, which also experienced a malfunction, or a performance failure, "perhaps every several months"[132], which was one of the reasons why it was replaced in June 2007.

Service Radio transmitting equipment fitted to the individual Fire Department [fire / rescue] vehicles is generally capable of communicating with other individual Fire Department [fire / rescue] vehicles, providing the transmitting unit is within the geographic range limit that the

[126] Motorola [model #] MCC 5500 Dispatch Console, as described in [Internet] http://www.motorola.com/staticfiles/Business/Products/Dispatch/Dispatch%20Consoles/MCC%205500/_Documents/Static%20Files/MCC_5500-RC-13-2012A.pdf

[127] which is located at the [main] transmitter / receiver communications tower facility, at the Clarke County Jail.

[128] which is located on elevated terrain, in the northeast section of Clarke County.

[129] a "repeater system" electronically boosts (enhances) the radio transmission signal wattage, so that the transmission signal can be received (and transmitted back to the originating station) at a greater geographic distance than would be possible without such an enhancement system.

[130] Comsouth, Inc., 1712 Highway 19 N., Meridian, MS 39307

[131] such a 'continuous monitoring capability' option, which is not a standard feature available to the Clarke County Communications System, was indicated (by the technical maintenance service contractor) to cost about $30,000, which is also beyond the current budgetary consideration of Clarke County (as indicated by the County Board of Supervisors).

[132] as described by the E911 / Central Dispatch Supervisor (i.e. the Director of the agency).

receiving unit is capable of receiving a signal from, where also, such transmitted signals between individual Fire Department [fire / rescue] vehicles may not necessarily be intercepted by the Fire Department [fire / rescue] Service Radio "repeater system" or the service radio main transmitter unit (and hence, E911 / Central Dispatch may not receive, or be aware of, that communication).

As noted above, Fire Department service radios operate on a separate radio frequency to that of the Sheriff Department. However, Service Radio transmitting equipment fitted to the individual Fire Department [fire / rescue] vehicles is also capable of communicating with Service Radio transmitting equipment fitted to the individual Sheriff Department vehicles by switching-over to the Sheriff Department transmitting frequency, although (the investigation observed that) this communication channel is not normally actively monitored by Fire Department [fire / rescue] personnel, where also, the Fire Department [fire / rescue] personnel will often need to be instructed to switch-over to the Sheriff Department Service Radio transmitting frequency for further communication.

6.8.5 Law Enforcement Communications

Radio communications by the Clarke County – E911 / Central Dispatch with the Clarke County Sheriff Department officers is performed in an identical manner to fire / rescue operations using conventional Service Radios, as fitted to the individual law enforcement vehicles (police cruisers) or hand-held service radios[133], etc. Also, as noted above, because of a somewhat limited radio signal transmission range, the Clarke County Sheriff Department utilizes a Sheriff Department radio signal "repeater system"[134], which is separate to the fire / rescue radio signal "repeater system" (as further described in this report; see § 6.8.4).

And as with fire / rescue, Service Radio transmitting equipment fitted to the individual Sheriff Department vehicles is generally capable of communicating with other individual Sheriff Department vehicles, providing the transmitting unit is within the geographic range limit that the receiving unit is capable of receiving a signal from, where also, such transmitted signals between individual Sheriff Department vehicles may not necessarily be intercepted by the Sheriff Department radio signal "repeater system" or the Service Radio main transmitter unit (and hence, E911 / Central Dispatch may not receive, or be aware of, that communication).

As also noted above, Sheriff Department service radios operate on a separate radio frequency to that of fire / rescue. However, as with fire / rescue, Service Radio transmitting equipment fitted to the individual Sheriff Department vehicles is also capable of communicating with Service Radio transmitting equipment fitted to the individual Fire Department [fire / rescue] vehicles by switching-over to the Fire Department transmitting frequency, although (the investigation observed that) this communication channel is not normally actively monitored by Sheriff Department personnel, where also, the Sheriff Department personnel will often need to be

[133] as a general observation, hand-held service radios have a somewhat limited transmission range (depending on the transmission power rating of the unit), although they can communicate directly with other nearby hand-held radios, as well as a "base-station" radio unit (as might be located at a fire station, or the County Communication Center).
[134] a "repeater system" electronically boosts (enhances) the radio transmission signal wattage, so that the transmission signal can be received (and transmitted back to the originating station) at a greater geographic distance than would be possible without such an enhancement system.

instructed to switch-over to the Fire Department [fire / rescue] Service Radio transmitting frequency for further communication.

6.8.6 Alternate / Back-up Communications Measures Available

a. Service Radio Communications - Alternate / Back-up Measures

As an alternate means of mobile communications for both Clarke County fire / rescue [agencies] and the Sheriff Department, which is available as a "back-up communications measure" for either agency (in the event the respective fire / rescue, or the Sheriff Department radio signal "repeater system" is not effectively communicating or functioning), because the Service Radio transmitting equipment of the individual Fire Department [fire / rescue] vehicles, and the individual Sheriff Department vehicles, are capable of "switching-over" to the transmitting frequency channel of each other (as further described in this report; see § 6.8.4, and § 6.8.5), E911 / Central Dispatch, and the respective Fire Department [fire / rescue], and Sheriff Department vehicles, are capable of communicating directly with each other by simply "switching-over" to the transmitting frequency channel of the other agency.

As another alternate means of mobile communications for both Clarke County fire / rescue [agencies] and the Sheriff Department, which is also available as a "back-up communications measure" (in the event the respective fire / rescue, or the Sheriff Department radio signal "repeater system" is not effectively communicating or functioning), E911 / Central Dispatch, and the respective fire / rescue, or Sheriff Department personnel, may also communicate using cellular telephones (either personally owned, or agency issued), which were also observed by the investigation to be widely used by personnel of the respective emergency services organizations.

The investigation also noted that many of the cellular telephones used by emergency services personnel in Clarke County had a SouthernLINC Wireless® communication feature[135], which functions somewhat as a 'walkie-talkie' feature of the cellular telephone, allowing personnel to speak (at the "push of a button") directly with other personnel who have that feature on their cellular telephone (within the transmitting-distance range of that feature). Again, as with the conventional Service Radio transmitting equipment, the limiting provision with this equipment is that the transmitting SouthernLINC Wireless® unit is required to be within the geographic range limit of the receiving SouthernLINC Wireless® unit, where also, such communications will not necessarily be intercepted by E911 / Central Dispatch unless the transmission is made within the noted geographic range limit, and Dispatch personnel are actively monitoring similar SouthernLINC Wireless® equipment (and hence, E911 / Central Dispatch may not be aware of that communication).

It was also observed by the investigation, that because of somewhat limited cellular telephone signal coverage offered by certain cellular telephone carriers in certain geographic locations within Clarke County, cellular telephone communication might not always be available, such that conventional "land-line" telephone service might be the only reliable communication medium

[135] cited by the service vendor as a "Premier Push to Talk two-way radio", as ref. by, and for further information, see [Internet] http://www.southernlinc.com/index.asp

available in certain geographic locations within Clarke County, where it obviously has an inherent limitation of not being a mobile communications medium.

b. Back-up Processing for Unusually Large Incoming 9-1-1 Call Volume

As a back-up system, incoming 911 calls to Clarke County – E911 / Central Dispatch, which are not immediately answered by operating personnel [after a predetermined number of 'rings'], because of an unusually large [emergency] call-volume at any given time, are automatically forwarded to the 9-1-1 Call Centers of adjacent counties [i.e. Wayne, Jasper, Lauderdale, in that sequence] for processing, where the professionally trained personnel of those agencies are available to assist, somewhat as a 'mutual aid' effort, in the processing of those 911 calls. Likewise, such a 'mutual aid' system is also in place for those adjacent counties, where Clarke County – E911 / Central Dispatch is available to process an unusually large [emergency] call-volume for those counties.

The investigation identified that during the initial stages of emergency response to the accident, a number of 9-1-1 calls destined for the Clarke County – E911 / Central Dispatch were received (apparently through the automatic call-forwarding system) by the Wayne County – 9-1-1 Call Center / Central Dispatch, which in turn, contacted the Clarke County – E911 / Central Dispatch to relay pertinent [9-1-1 caller] information, where also that agency directly dispatched emergency services resources [of Wayne County] to the reported event site.

6.8.7 Operating Personnel Training

Briefly summarized, training for Clarke County – E911 / Central Dispatch operating personnel consists of both formal classroom instruction, and an 'on-the-job' instructional regimen where 'new recruit' personnel are closely monitored / supervised (for a specified training interval) by experienced operating personnel while performing routine 9-1-1 call processing and emergency services Dispatching.

The investigation identified that such training for E911 / Central Dispatch operating personnel addresses established guidelines / procedures of that agency for responding to certain types of emergency services requests for routine fire / rescue, law enforcement [police], EMS dispatch, and many other emergency services request calls. Included in such training, for example, is guidance on how to appropriately answer a call (e.g. "9-1-1, what is your emergency?"), what information to obtain from the caller (e.g. type of incident, describe what is happening now, specific location, etc.), potential instructions to the caller on what to do to avoid further peril as might be obvious and/or appropriate for the circumstances (e.g. immediately get everybody out of a burning building), and (if appropriate) advise the caller that emergency response resources would be sent in response to the call. Also addressed in such training are information resources that are available to consult in order to analyze and process the call (e.g. use "caller ID" [for caller's phone number and address], use detailed / large-scale County maps to locate caller's address, to verify street names / roadway numbers, or to potentially identify nearby fire / rescue agencies, etc.).

The investigation identified that the above described training does not address specific guidelines / procedures for addressing critical pipeline emergency events, such as occurred in this accident (i.e. a propane pipeline rupture with substantial product release into a populated area, and subsequent explosion and fire, widespread evacuation, etc.).

However, in lieu of not having such guideline / procedural training that addresses an event such as a critical pipeline emergency (as occurred in this event), E911 / Central Dispatch has established guidelines / procedures for call-processing personnel on how to handle routine emergency events within their jurisdiction, such as:

- upon receiving a report of a "gas leak", where the caller indicates there was no fire (as initially occurred in this event), where, because the report location [a residence] did not likely have commercially supplied, 'piped-in', natural gas, where also it is reasonably to assume that such a [reported] gas leak was originating from a relatively small, residential sized, outdoor propane storage tank, the prescribed standard response would be a Dispatch to the scene of both police and fire / rescue resources (of the jurisdiction involved), and then stand-by for the responding police or fire / rescue agencies to indicate if a further ('mutual aid') response is needed, and
- upon receiving subsequent reports, from several callers over a relatively widespread area, of 'a large explosion and substantial fire' (as subsequently occurred in this event), the prescribed standard response would be an 'all-hands' Dispatch to the scene of both police and fire / rescue resources (of the jurisdiction involved), as immediately followed by a Dispatch of appropriate 'mutual aid' law enforcement and fire / rescue resources (as needed), a Dispatch of EMS [ambulance], and expedient contact with, or a Dispatch of, specialty / technical support agencies, as needed (e.g. the pipeline owner / operator, Emergency Management, Coroner's Office, local hospital [alert], hazardous materials response resources, mass evacuation support resources [e.g. Red Cross], etc).

6.8.8 911 Call-Processing / Dispatch - Resources Available

Clarke County – E911 / Central Dispatch operating personnel receive and process telephone requests for emergency services according to procedures established by the agency for a response to fire / rescue, law enforcement [police], EMS dispatch, and other emergency services request calls (as further described in this report; see § 6.8.7). Basically described, resources available to the operating personnel to perform that process include a call-processing [computer based] communications console, a Dispatch Service Radio System to communicate with the various emergency response agencies within the jurisdiction (using both a "base-station" transmitter / receiver, and 'hand-held radio' units), as well as the commercially supplied (conventional) telephone system for other routine communications.

As facilitation to the above, informational resources available to 9-1-1 call-processing personnel to process the calls includes, for example, the capability, in many cases[136], of identifying the telephone number of a caller (commonly referred to as a 'caller ID' feature) and to identify the physical location [address] of the caller's telephone, both features of which are integrated into the call-processing [computer based] communications console. Printed documentation resources

[136] refers to 'fixed-location' telephone equipment, where the exception is cellular [mobile] telephone equipment.

available includes detailed, large-scale Clarke County map(s), which cite, for example, local jurisdictional and municipality names, local roadway names and numbers, locations of major geographic and other local infrastructure features. The investigation identified, however, that the County map(s) utilized did not identify the locations of the numerous underground transmission pipelines that traverse Clarke County.

E911 / Central Dispatch operating personnel also utilize the resource of their personal 'local knowledge' of the jurisdictions and municipalities within the County, which is, due to subtleties of local topography / geography, infrastructure colloquialisms [identification of lesser-known / unmapped roadways, trails, etc], current local events [which might influence how a particular emergency event is most efficiently / safely handled], etc., often demonstrated as being more valuable than many of the physical infrastructure resources that are available.

6.8.9 Participation in Preparedness Drills / Training Exercises

a. Clarke County – E911 / Central Dispatch routinely participates in scheduled Preparedness Drills / Training Exercises, as conducted on:
   - a local jurisdictional level within Clarke County (e.g. where only CVFD, or the City of Quitman FD, conducts a drill exercise), and
   - a Clarke County-wide level (e.g. a drill exercise incorporating resources of Clarke County Sheriff Department, Clarke County Emergency Management, the local hospital, and multiple individual law enforcement, fire / rescue, or other jurisdictional emergency services agencies), and
   - a multiple-County level (e.g. a large-scale, joint Clarke / Wayne / Lauderdale County Preparedness exercise), where also state support resources potentially participate (e.g. MS Highway Patrol, Southeast 2 Regional Response Team, etc.).

b. Prior to the event, Clarke County – E911 / Central Dispatch had not participated in any recent (i.e. within the past approximately three years) Government Liaison - Emergency Response Program emergency responder familiarization activities, as conducted by Dixie / Enterprise Products, or it's technical contractor [The Pipeline Group®] (as further described in this report; see § 6.9.4.b). Also, E911 / Central Dispatch had not received a copy of documents titled "The Pipeline Group® Emergency Response Manual" or a "General Information Guide to a Pipeline Emergency", as distributed to, and supportive of, emergency response agency attendance at the Government Liaison - Emergency Response Program familiarization events (as further described in this report; see § 6.9.1.h), and had not received a copy of a document titled "A Guideline for Emergency Response Agencies", as made available by Dixie / Enterprise Products to local [jurisdictional] emergency response agencies (as further described in this report; see § 6.9.1.m).

6.9 Dixie / Enterprise Products - Emergency Preparedness Measures[137]

[137] source: on-scene interviews with, and documentation supplied by, Dixie / Enterprise Products personnel, with background information sourced from [Internet] http://www.eprod.com/, and http://www.epplp.com/

6.9.1 Corporate / In-house - Preparedness Measures Overall

Preparedness Measures for the pipeline operation, as implemented and/or executed by Dixie / Enterprise Products, are briefly summarized as follows[138].

a. Dixie / Enterprise Products maintains an Operations Control facility in Houston, TX, which is continuously staffed (24 hrs/day) by technical specialists who are trained in pipeline system operation under normal operating conditions, and who are trained also to address adverse incidents, or emergency events or activities involving pipeline operations (e.g. pipeline rupture / unintended product release). Dixie employees operate the Dixie Pipeline System from this Operations Control facility.

b. Dixie / Enterprise Products maintains a Safety Policies Manual containing Section 2.1 "Incident Notification Policy", which provides instructional guidance for operating personnel on procedures to be followed in the event of an adverse incident involving pipeline operations.

c. Dixie / Enterprise Products maintains a Procedures Manual containing Section 4.0 "Emergency Procedures", which provides instructional guidance for operating personnel on procedures to be followed in the event of an adverse incident involving pipeline operations.

d. Dixie / Enterprise Products maintains a document titled "Dixie Pipeline Emergency Response Manual", which provides instructional guidance for operating personnel on procedures to be followed in the event of an adverse incident involving pipeline operations.

e. Dixie / Enterprise Products maintains a document "Dixie Pipeline Company Public Awareness Plan", to address statutory public awareness requirements, which was prepared in concert with API – RP 1162[139], to "… provide a framework that will allow Dixie Pipeline Company to effective communicate with a variety of key Stakeholder audiences in the communities where [Dixie Pipeline] operates …".

f. Dixie / Enterprise Products presented documentation on a formal ("hands-on" / "Live Scenario Exercise") Emergency Drill, that was conducted by Dixie / Enterprise Products, in August 2006, on Highway Route 84, in Wayne County (near Waynesboro), MS, involving a staged pipeline rupture (initiated by [staged] unauthorized excavation), as further described in this report (see § 6.9.4.a).

g. In compliance with API – RP 1162[121], Dixie / Enterprise Products conducts, through it's technical contractor [The Pipeline Group®], periodic familiarization events titled "Government Liaison - Emergency Response Program", which are held for the jurisdictional emergency response agencies (e.g. fire / rescue, law enforcement, LEPC's, emergency management, commissary support organizations [e.g. Red Cross], etc.) in the constituent

[138] implementation / execution pursuant to the requirements of applicable statutory Regulation, as further described in this report (see § 9.0), cited in no particular sequence order.
[139] pursuant to 49 CFR 195.440 (as further described in this report; see § 9.1, and § 9.2)

counties[140] of Dixie / Enterprise Products pipeline operations in MS and AL. The three most recent familiarization events held for the jurisdiction encompassing Clarke County (which were held in Meridian, MS) are as further described in this report (see § 6.9.4.b).

h. Supportive of the Government Liaison - Emergency Response Program emergency responder familiarization events (described in this report Section, immediately above), Dixie / Enterprise Products developed, through it's technical contractor [The Pipeline Group®], and maintains two publications titled "The Pipeline Group® Emergency Response Manual" and a "General Information Guide to a Pipeline Emergency", respectively, to address emergency response procedures, for no-cost distribution[141] to emergency response organizations that participate in the Program in the constituent counties[142] of Dixie / Enterprise Products pipeline operations in MS and AL.

   Multiple requests were placed to the technical contractor [The Pipeline Group®] by the Investigation, for a printed copy of the two publications ("The Pipeline Group® Emergency Response Manual" and a "General Information Guide to a Pipeline Emergency") as distributed emergency response organizations that participate in the Government Liaison - Emergency Response Program, which were not forthcoming in time to be addressed in this report. As the content of the publications is a consideration in assessing the content / effectiveness of the Government Liaison - Emergency Response Program, it is anticipated that the two subject publications will be subsequently addressed in a separate Addendum to this report (to be available in the public docket).

i. Dixie / Enterprise Products maintains an 800 / toll-free phone number system at the Houston Operations Control facility, which is continuously staffed (24 hrs/day) by Operations Control technical specialists, who are available to receive notifications of emergency events or activities involving the pipeline, from both the public and local emergency response organizations, as well as pipeline personnel, in which also the Dixie technical specialists are able to contact and/or mobilize various Dixie / Enterprise Products [internal] technical resources, contracted [external] technical resources, as well as contact and interface with appropriate local emergency response agencies, such to be able to effectively address such identified emergency events or activities.

j. Dixie / Enterprise Products maintains a contingent of contracted [external] personnel who are technical resources which are trained to address emergency events or adverse activities involving the pipeline, which are also strategically stationed proximate to the various principal local pipeline facilities (i.e. pumping stations, isolation [block] valves, etc.), which upon notification (by Operations Control, or similar authority) of an emergency event that requires an exigent response or an on-scene presence by trained technical specialists, are

[140] comprised of Clarke, Jasper, Kemper, Lauderdale, Neshoba, Newton, and Scott counties in MS, and Choctaw county in AL

[141] distribution consists of presenting the document to the individuals of the emergency response agencies who personally attended the Government Liaison - Emergency Response Program familiarization event, and also mailing a copy of the document to the [contact individual of the] emergency response agencies who did not attend the familiarization event.

[142] comprised of Clarke, Jasper, Kemper, Lauderdale, Neshoba, Newton, and Scott counties in Mississippi, and Choctaw county in Alabama.

available for expedient mobilization and dispatch to a given locality, such to be able to effectively address identified emergency events or activities, and be available to interface with both the public, as well as local emergency response agencies.

k. Dixie / Enterprise Products maintains a contingent of company-employed [internal] personnel who are technical resources which are trained to address emergency events or adverse activities involving the pipeline, which are also strategically stationed at technical facilities of the company[143], which upon notification (by Operations Control, or similar authority) of an emergency event that requires an exigent response or an on-scene presence by trained technical specialists, are available for expedient mobilization and dispatch to a given locality, such to be able to effectively address identified emergency events or activities, and be available to interface with both the public, as well as local emergency response agencies.

l. Dixie / Enterprise Products periodically distributes, at no cost to the recipients, Pipeline Awareness and Safety Literature, and other instructional materials, to the residents and businesses of the localities through which the Dixie / Enterprise Products pipeline traverses, to provide information on pipeline location recognition (e.g. markers), contents transported, leak recognition, general emergency response actions, guidelines for right of way use by property owners, excavation precautions and prohibitions (i.e. the toll-free 8-1-1 "Call Before you Dig" program, and the "One-Call Center" telephone numbers), and emergency contact information (i.e. Dixie / Enterprise Products' toll-free 800 number). The four documents identified are distributed under the titles:

   - "Pipeline Safety is Everyone's Responsibility" (a pamphlet, printed as a bi-lingual [English / Spanish] document),
   - "To Dixie's Neighbors" (a letter),
   - "Guidelines for ROW Use by Property Owners" (a document), and
   - "Helpful Information for People Who Live or Work Near Our Pipeline" (a pamphlet).

m. As elements of what Dixie / Enterprise Products describes as a 'comprehensive outreach initiative', to help keep local emergency responders prepared for pipeline accidents, Dixie / Enterprise Products:

   - makes available, directly to local emergency response agencies, at no cost to the recipients, planning and training materials [informational publication(s)] on pipeline operations and/or product release emergency procedures, including a publication titled "A Guideline for Emergency Response Agencies", which provides general familiarization information on the Dixie / Enterprise Products' overall pipeline operation, a summarization of [propane] product characteristics, how to identify a

[143] Dixie / Enterprise Products technical personnel who responded to the Carmichael event were stationed at the company facility located in Petal, MS (which is located about 1 mi. east of Hattiesburg, MS, and also located about 80 mi. southwest of the community of Carmichael, MS).

[product] release, and basic instructions on how to respond to an emergency event involving a pipeline[144], and

- periodically conducts, at no cost to the recipients, formal ("hands-on") instructional / familiarization and emergency procedures training sessions with local emergency response agencies on pipeline operations, or simulated / unintended product release emergency procedures training.

6.9.2 Preparedness Measures Involving Carmichael and/or Clarke County

Dixie / Enterprise Products represented to the investigation that planning and training materials [informational publications] on pipeline operations, and/or product release emergency procedures, had been recently made available to the local emergency response agencies of the community of Carmichael and/or Clarke County, which were also distributed through the Government Liaison - Emergency Response Program emergency responder familiarization activities that were conducted (as further described in this report; see § 6.9.4.b).

6.9.3 Training Exercises Conducted Within Clarke County

Dixie / Enterprise Products represented to the investigation that formal ("hands-on" / "Live Scenario Exercise") familiarization with pipeline operations, or simulated / unintended product release emergency procedures training had not been conducted with the local emergency response agencies of the Carmichael community, and/or Clarke County in the recent time period (at least approximately 5 years) prior to the accident.

6.9.4 Training Exercises / Activities Conducted Outside of Clarke County

a. Waynesboro, MS / August 2006

Dixie / Enterprise Products presented documentation[145] on a "hands-on" / "Live Scenario Exercise" Emergency Training Drill, that was conducted by Dixie / Enterprise Products, on August 28, 2006, on Highway Route 84, in Wayne County (near Waynesboro), MS, (as previously noted in this report; see § 6.9.1.f). The event involved a staged pipeline rupture (initiated by [staged] unauthorized excavation), resulting in a liquid / vapor release, fire, and injuries, which involved a comprehensive emergency services (i.e. local fire / rescue agencies, police agencies, ambulance [medical transport to a local hospital], Incident Command, with a substantial mutual aid response, a decontamination station) and pipeline operator response. Twenty-one volunteer 'victims' [local High School students] attended, with 33 local firefighters, 44 medical personnel, and nine LEPC personnel participating in this half-day event. The CVFD did not attend this event, which was located about 25 miles south of the community of Carmichael.

b. Meridian, MS / 2007, 2006, and 2005

[144] a printed copy of which was made available to the Investigation.
[145] the documentation included attendee 'sign-in sheets' and formal 'critique assessment' reports on the event.

In compliance with API - RP 1162[146] (as previously noted in this report; see § 6.9.1.g), Dixie / Enterprise Products conducted, through it's technical contractor, The Pipeline Group®, a one-day[147], 'lecture format', emergency responder familiarization activity program, titled the "Government Liaison - Emergency Response Program"[148], for the jurisdictional emergency response agencies, and associated emergency services agencies[149] in the constituent eight counties (in Mississippi and Alabama) through which the Dixie / Enterprise Products pipeline traverses in the region[150]. As exemplary demonstration of recent participation in this activity, Dixie / Enterprise Products presented [three individual] documents describing the familiarization activities for the three years prior to the accident, which were conducted on April 5, 2007, April 18, 2006, and April 26, 2005, respectively, which were held [by the technical contractor] at an activity site in Meridian, MS, which is about 40 miles north of the community of Carmichael.

A review of the documentation on the Program activities, as prepared by the technical contractor[151], identified that, for the three years of records that were reviewed, attendance for Clarke County emergency services agencies was comprised of:

	---------- Representative(s) from ----------					
	CVFD		Clarke County Sheriff Department		Clarke County Emergency Management	
Year	agency invited	number of attendees	agency invited	number of attendees	agency invited	number of attendees
2005	yes	2 [1]	yes	0	yes	0
2006	yes	0	yes	0	yes	2 [2]
2007	yes	2 [3]	yes	1 [4]	yes	2 [5]

Attendee notes (i.e. attendance from the cited agency included):

[1] a Captain, and the Secretary/Treasurer (who is also a firefighter) of the organization
[2] the Director of the organization, who was accompanied by a Clarke County employee
[3] the Chief, and a Captain of the organization
[4] a Chief Deputy Sheriff (who is also a Criminal Investigator) of the organization
[5] the Director of the organization, who was accompanied by a Clarke County employee

6.9.5 Participation in Training Exercises / Activities by Emergency Services Communications Agencies

a. Generic Communications Agency Participation

[146] pursuant to 49 CFR 195.440 (as further described in this report; see § 9.1, and § 9.2).
[147] the duration of a typical familiarization activity conducted was identified to actually be about 2½ hours.
[148] as also described in [Internet] http://www.pipelinegroup.com/programs/erprogram.shtml
[149] e.g. state, local, and regional Emergency Management agencies, jurisdictional LEPC's, Mississippi and Alabama [state] Forestry Commissions (which perform forest fire suppression services), etc.
[150] comprised of Clarke, Jasper, Kemper, Lauderdale, Neshoba, Newton, and Scott counties in MS, and Choctaw county in AL
[151] source: 'Invitation List(s)', 'sign-in sheets', and related activity documentation made available by The Pipeline Group®, which confirmed that the identified personnel had been invited to, and/or actually attended, the sessions.

A review of the [API - RP 1162 compliant] Government Liaison - Emergency Response Program activity documentation (noted in § 6.9.4.b, as prepared by the technical contractor[152]), for the three years examined (April 2005 through 2007, inclusive)), identified that *emergency services communications agencies* (a.k.a. 911 - Emergency Call Centers / Central Dispatch) for the various emergency services jurisdictions of the Meridian familiarization activity Program had not been included, by specific communications agency name, in the Invitation List(s) for the events. In conjunction with this, the investigation did observe, however, that often, the operations of noted emergency services communications agencies are comprised within the domain and responsibility of the law enforcement agencies, or fire / rescue agencies, for the various emergency services jurisdictions, in which also representatives of those particular emergency services communications agencies would potentially be included in the invitation to the familiarization activity, but might not necessarily be invited by specific communications agency name.

b. Participation by Clarke County – E911 / Central Dispatch

In consideration of the above (§ 6.9.5.a. Generic Communications Agency Participation), in this investigation (i.e. at the time of the accident), the Clarke County – E911 / Central Dispatch [agency] was not comprised within the domain and responsibility of the jurisdictional law enforcement agency [Clarke County Sheriff Department][153]. Also, a principal of that agency[154] indicated that their agency had not participated in any recent (i.e. within the past approximately three years) Government Liaison - Emergency Response Program familiarization events as conducted by Dixie / Enterprise Products, or it's technical contractor [The Pipeline Group®], and had not received a copy of the two publications titled "The Pipeline Group® Emergency Response Manual" or a "General Information Guide to a Pipeline Emergency", as distributed to, and supportive of, emergency response agency attendance at the Government Liaison - Emergency Response Program emergency responder familiarization events (as further described in this report; see § 6.9.1.g, and § 6.9.1.h, respectively).

6.9.6 Integrity Management Program

Pursuant to the requirements under 49 CFR 195.452 [155], Dixie Pipeline Company compiled an Integrity Management Program to address integrity management of the pipeline in "high consequence areas" (HCA).

Select informational elements of the Integrity Management Program, as supplied to the Investigation by Dixie / Enterprise Products, on the "Segment Identification", the "Procedure for Identifying HCAS and HCA Segments" [of the Integrity Management Program], and the "HCA

[152] ref. 'Invitation List(s)', 'sign-in sheets', and related activity documentation made available by The Pipeline Group®

[153] prior to June 2007, operations of the Clarke County Communications Center had been comprised within the domain and responsibility of the Clarke County Sheriff Department, where now (at the time of the accident), operations of the Clarke County Communications Center are comprised within the domain and responsibility of the Clarke County Board of Supervisors.

[154] the Director of Clarke County Communications [agency]

[155] as further described in this report; see § 9.1 and § 9.3.

Detail Assessment" for the segment of [Main Line / propane] pipeline located in Clarke County, are provided in Exhibit 10.

7.0 The Emergency Response

7.1 Event Chronology / Timeline

A key instrument used to examine the constituent activities of the emergency response to an adverse event is an *event chronology* ("Timeline"), which is constructed in an investigation to identify the sequential activity facts of the event, to help identify, for example, achievements and shortcomings, challenges and pitfalls, as well as potential issues, as might have occurred during the initial notification to the local emergency response authorities, as well as during the execution of the emergency response effort (e.g. search and rescue / fire suppression) and aftermath. Also, if appropriate, the Timeline can serve as a mechanism to foster constructive discussion of the event among the participants of the emergency response (e.g. to identify particularly noteworthy advocacy / initiatives that have been implemented, which the organizations would like to share for the overall benefit of the professional emergency community). Further, the Timeline can also help to foster discussion on potential amelioration efforts (if any) that might help remedy problematic issue(s) identified, and to help avoid future re-occurrences.

In support of this, the principal responding emergency services agencies were requested to provide incident response data and communications information (relevant to this event), and Safety Board staff also conducted individual debriefing interviews with key personnel of a number of responding emergency services agencies and the pipeline owner / operator - management service provider, the collective content of which is briefly summarized as follows.

A copy of the Fire / Rescue - Event Chronology Timeline Narrative, compiled during the investigation, is provided in Exhibit 11.

7.2 Notification(s) to Emergency Response Authorities

The investigation identified[156] that the pipeline rupture appears to have likely occurred at 10:35:01, on November 1, 2007. Based upon witness testimony, the propane gas released by the rupture did not immediately ignite, but an explosive ignition [of released propane gas] and a substantial fire did result a short time later, although the investigation was unable to definitively identify this time interval (witness testimony, and Timeline activities suggest this time interval was about 7½ minutes after the pipeline rupture occurred).

The initial notifications to the pipeline owner / operator - management service provider, and the jurisdictional emergency response agencies are briefly summarized as follows[157].

7.2.1 Pipeline Owner / Operator and Management Service Provider[158, 159]

[156] source: correspondence, dated Nov. 19, 2007, submitted to the investigation by Enterprise Products, describing the methodology used by Enterprise Products in identifying the time that pipeline rupture likely occurred.
[157] all activities described in this report section occurred on November 1, 2007, unless noted otherwise

At 10:35:13, the Control Operator at the Enterprise Products Operations Center (in Houston, TX) observed a "High-High State" activity message on the SCADA operations control panel for the Carmichael pumping station, which indicated an automated alert [to the Control Operator] of a problem at that pumping station, in which the Control Operator then commenced a shutdown process of the pipeline operations.

At about 10:41 am, a telephone call was placed by an occupant [resident] of a residential dwelling located in the 8500 block of CR 630, to the Enterprise Products Operations / Control facility in Houston, reporting what appeared to be some kind of adverse event that was occurring with the pipeline near this individual's residence. The resident utilized the Dixie / Enterprise Products' 800 / toll-free emergency contact telephone number, in which also the Control Operator (overseeing the problem at the Carmichael pumping station, as noted above) personally conversed with the resident to obtain information.

7.2.2 Local Emergency Response Authorities[160]

a. Clarke County 9-1-1 [161]

At 10:39:56, a call was placed by an individual using a telephone in a residence located at 4195 County Road 621 to the Clarke County – E911 / Central Dispatch, reporting that a "gas explosion [had occurred] somewhere around here", and that there was "smoke and gas coming out around the house", although when asked if there was fire present, the caller indicated that she did not see any fire, and indicated there was "white gas" in the area. The residential dwelling located at this address was subsequently identified as the location where one of the two fatalities occurred (as further described in this report; see § 4.2.1 and § 8.1.2). Responsive to this, E911 / Central Dispatch commenced to respond police and fire / rescue resources to the scene (as further described in this report; see § 7.3.1, et seq.).

At 10:40:13, a second 9-1-1 call was placed by an individual using a telephone in a residence located in the 4300 block of CR 621 (located about 600 feet to the south of the [above noted] 4195 County Road 621 address), reporting what was occurring, which concluded at 10:41:46.

Numerous additional calls to report the incident were subsequently received by E911 / Central Dispatch from other locations proximate to the accident site.

At 10:49:51, the Dixie / Enterprise Products Control Operator (overseeing the problem at the Carmichael pumping station) placed a telephone call the Clarke County – E911 / Central

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[158] source: SCADA data, and interview of the Control Operator and the [resident] witness who placed the phone call.
[159] specific performance activities of the Control Operator at the Enterprise Products Operations Center (in Houston, TX) were addressed by the Human Performance [working] Group, which has compiled a [separate] Factual Report of information in this regard.
[160] ref. Exhibit 11 of this report, and as further sourced, as noted.
[161] source: Addendum to Survival Factors Factual Report "Clarke County 911 - Emergency Call Center / Central Dispatch – Activities Timeline", which provides documentation detailing all relevant and identified (9-1-1 calls / Emergency Services Dispatch) communications activities of the Clarke County – E911 / Central Dispatch, as reported to the Investigation by that agency.

Dispatch (via a long-distance line), intending to provide a notification of a pipeline system anomaly [proximate to the Carmichael pumping station], but was told that they [Clarke County – E911 / Central Dispatch] were already aware of an event near that location, and had dispatched three fire / rescue trucks to the scene.

b. CVFD[162]

The resounding sound of what appeared to be an explosion (that occurred in the distance) is heard by the Assistant Chief of the CVFD (at what is now surmised as being about 10:42:30 am[163]), who was at his place of business (located about ¼ mile from the CVFD fire station). This sound is followed shortly thereafter by the sound of a 2nd explosion, and perhaps the sound of a 3rd explosion. Moments later (estimated to be about 10-15 seconds), a large fireball plume and a pronounced cloud of heavy black smoke are also seen, in an easterly direction, rising above the tree line. Responsive to this, the Assistant Chief immediately commenced to respond CVFD resources to the scene (as further described in this report; see § 7.3.2).

c. Wayne County 9-1-1 [164, 165]

At 10:42:50, a call was placed to the Wayne County 9-1-1 agency, by an individual using a [cellular] telephone, who was located at a construction site (on a road to the north of Waynesboro), to report "an explosion somewhere either on [one of two identified roads, to the northeast of the caller's location, in the direction of Matherville]". Responsive to this (as well as another 9-1-1 call that was received commencing about 17 seconds later) the Wayne County E911 / Central Dispatch commenced to respond emergency services resources to the incident (which was comprised initially of a Wayne County Sheriff deputy [to verify the incident location], and then 'mutual aid' fire / rescue, as further described in this report; see § 7.3.3).

An interview by NTSB staff with this initial 9-1-1 caller, who appeared to be a credible witness[166], indicated that this individual had placed [initiated] the call to 9-1-1 an estimated 20 seconds after personally hearing the resounding sound of what appeared to be an explosion (that occurred in the distance) and seeing a large fireball plume and a pronounced cloud of heavy black smoke rising above the tree line in a northeasterly direction from his location (which, in examining a Wayne County and a Clarke County map, indicated that the [explosion] location was to the northeast of the community of Matherville).

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[162] source: on-scene and subsequent interviews with the Assistant Chief of the CVFD.
[163] this time reference is based upon witness testimony (as further described in this report; see § 7.2.2.c) and corresponding Timeline observations [for the explosive ignition event], in that the Assistant Chief did not actually note the time of the [explosion] event, as he personally observed it.
[164] the northern boundary of Wayne County borders the southern boundary of Clarke County (where the accident location was about 3 miles north of the Wayne County boundary), in which also the explosion (large fireball plume) and heavy black smoke was clearly observed (above the tree line, to the north) by individuals in Wayne County.
[165] source: CAD Incident Report documentation supplied by Wayne County 9-1-1 Emergency Call Center / Emergency Services Dispatch, and interviews of principals of that agency and corresponding [Wayne County] fire / rescue agencies.
[166] the caller (an adult male) indicated he is currently employed as an independent construction contractor, and had previously served as a Wayne County Deputy Sheriff officer.

7.3 Execution of the Emergency Response[167]

7.3.1 Clarke County – Initial Dispatch of Emergency Services Resources[168]

At about 10:42 am, upon receiving notification of the event (resulting from two 9-1-1 calls received from County Road 621, the second call of which concluded at 10:41:46 am), E911 / Central Dispatch placed a radio Dispatch Page to the CVFD (i.e. the CVFD was "toned-out"), with a request to respond resources to the location that reported the incident on CR 621[169]. Unknown to E911 / Central Dispatch operating personnel, at that time, was that there had been what was subsequently identified as an 'apparent malfunction' of the Fire Department radio signal "repeater system", in which also (it was later determined), the radio dispatch Page to the CVFD had not actually been transmitted, which also the E911 / Central Dispatch operating personnel were not aware of.

At about 10:44 am, upon not receiving a radio response acknowledgement to the initial dispatch Page that had been placed to the CVFD about two minutes earlier, E911 / Central Dispatch repeated the radio dispatch Page, which this time was placed to the Theadville Volunteer Fire Department[170], with a request to respond to the CR 621 address of the 911 call. Again, unknown to E911 / Central Dispatch (at that time) was that the Fire Department radio signal "repeater system" had apparently malfunctioned, and the radio dispatch Page to this organization had not been transmitted.

At about 10:48 am, upon not receiving a radio response acknowledgement to the radio dispatch Page that had been placed to the Theadville Volunteer Fire Department about four minutes earlier, E911 / Central Dispatch repeated the radio dispatch Page, which this time was placed to the Theadville Volunteer Fire Department, the CVFD, the Desoto Fire Department, and the Quitman Volunteer Fire Department, with a request to respond to the CR 621 address of the 911 call[170]. Again, unknown to E911 / Central Dispatch (at that time) was that the Fire Department radio signal "repeater system" was still apparently malfunctioning, and the radio dispatch Page to the Fire Departments had not been transmitted.

At about 10:55 am[171], E911 / Central Dispatch operating personnel, upon not receiving a radio response acknowledgement to the dispatch Page that had been placed to the four fire departments about seven minutes earlier, began to suspect that the Fire Department radio signal "repeater system" had apparently malfunctioned, where (it now became apparent that) none of the prior radio dispatch Pages to the Fire Department's had been transmitted / received. Responsive to this, pursuant to the Clarke County – E911 / Central Dispatch back-up communication plan, they switched-over to the Clarke County Sheriff Department radio signal "repeater system", which

[167] source: interviews with principals of the individuals responding emergency services agencies, and applicable supporting documentation as might be received accordingly, as further described in this report section.
[168] ref. Exhibit 11 of this report, as further sourced from the Addendum to Survival Factors Factual Report "Clarke County 911 - Emergency Call Center / Central Dispatch – Activities Timeline".
[169] per standard operating procedure of E911 / Central Dispatch (as further described in this report; see § 6.8.1.b).
[170] per standard operating procedure of E911 / Central Dispatch (as further described in this report; see § 6.8.1.c).
[171] the [Logged 10:48] notation was subsequently determined to be inaccurate by several minutes (possibly due inadvertent errors in manually recording the time by E911 / Central Dispatch personnel, as further described in this Report; see § 6.8.2.b).

was correctly operating[172]. A message was also received (approximately simultaneously) from the Sheriff, as relayed by a Deputy, to switch to the Sheriff Department radio signal "repeater system" (as further described in this report; see § 7.3.4)[173].

E911 / Central Dispatch indicated that the maintenance contractor for the Fire Department radio signal "repeater system" was notified a short time later of the apparent system malfunction and placed a request for an expedited service call[174] (as further described in this report; see § 7.9).

At about 10:56 am, E911 / Central Dispatch apparently received a 'relayed' radio / telephone communication[175, 176] (likely from one of the on-scene Deputy Sheriff officers), which provided, on behalf of the CVFD, an 'on-scene / arrival status' report[177], indicating, to the effect, that resources[178] of the CVFD[179] had just arrived proximate to the scene (i.e. intersection of CR 620 and CR 621), and that the CVFD [fire truck] was apparently the first arriving piece of firefighting apparatus at the scene, and that the CVFD had already initiated a dispatch of other CVFD resources to the scene, and that word to switch-over to the Sheriff Department radio frequency had been received by the CVFD.

Activities of the principal jurisdictional emergency services agencies, law enforcement, mutual aid, and other technical and administrative support organizations that responded to the accident, are summarized as follows.

7.3.2 Fire / Rescue Tactical Response – CVFD[180]

a. Initial Response to the Scene

Responsive to what had occurred (i.e. in hearing the explosion and in personally seeing the fireball plume and heavy black smoke, at what is now surmised as being about 10:42:30 am), in an effort of making an expedient first-hand determination at what was occurring, the CVFD Assistant Chief immediately commenced to drive his POV in the direction of the fireball plume

[172] as a back-up communication procedure, Clarke County fire department vehicles [fire trucks] have the on-board capability of transmitting on the Clarke County Sheriff Department radio signal frequency, and vice-versa (as further described in this report; see § 6.8.6.a).
[173] neither an audio record in the recorded radio or telephone call [audio] channels, nor a notation (of this communication) in the Dispatch Log Sheets was found, although it's possible that this call was made using a non-recorded cell phone, or administrative phone line of E911 / Central Dispatch, and this item was inadvertently omitted due to the activity burden occurring at that time.
[174] in which also the contractor indicated that a (professionally trained) Service Technician would be immediately dispatched to Clarke County / 911 - Central Dispatch, to diagnose the problem / repair the equipment.
[175] an audio record in the recorded radio or telephone call [audio] channels was not found, although it's possible that this call was made using a non-recorded cell phone, or administrative phone line of E911 / Central Dispatch.
[176] a '10-23' notation (addressing this activity) was found in the Dispatch Log Sheets as occurring at 10:50, which was subsequently determined to be inaccurate by several minutes (possibly due inadvertent errors in manually recording the time by E911 / Central Dispatch personnel, as further described in this Report; see § 6.8.2.b).
[177] i.e. a "10-23" Dispatch radio message.
[178] i.e. the responding CVFD pumper truck, containing the CVFD Assistant Chief and the CVFD Captain.
[179] which is the primary fire / rescue agency for that jurisdiction, and which is also the initial fire / rescue agency that had been Dispatch Paged to respond to the scene (a message that was never actually received by the CVFD).
[180] source: CVFD - Assistant Chief and Fire Chief; on-scene, and subsequent interviews, and contributed documentation.

and heavy black smoke. While en route, the Assistant Chief immediately connected with the CVFD Chief of the department[181] via his [personally owned] cellular telephone, which incorporated a SouthernLINC Wireless® communication feature[182], at which time the two conferred briefly on what had occurred, preliminarily identified the location (which was sufficient to direct CVFD resources to the general area of the accident), and concurred that a response of the CVFD would be initiated, in which also the Assistant Chief would commence to directly muster / dispatch CVFD resources to the scene, and then meet the CVFD Chief at the scene. The Assistant Chief then diverted the short distance back in the direction toward the CVFD fire station, while simultaneously connecting with several other CVFD personnel via his SouthernLINC Wireless® communication feature, to provide a notification of what occurred, and a request to respond resources to the scene.

Moments later, upon arriving at the CVFD fire station, the Assistant Chief and a CVFD Captain (who arrived approximately simultaneous to the Assistant Chief) departed immediately from the fire station in a pumper truck, and commenced to attempt to contact E911 / Central Dispatch (to advise of the CVFD's response to the scene), but were not immediately successful[183]. Other CVFD resources were contacted, with instructions to bring the remaining CVFD firefighting vehicles [2 tanker trucks] to the scene. A message was successfully relayed to E911 / Central Dispatch a short time later, to report their arrival status, etc. (as further described, below).

Upon approaching the scene and seeing a substantial / fully-involved fire and a pronounced cloud of heavy black smoke being released, the two CVFD command officers strongly suspect that the fire was likely sourced from the propane pipeline that passed [buried] through the cattle pasture at that location. The extent of fire spread, and/or the number and locations of civilians, who might be in peril, was not known to them at that time. It became apparent that the residences on CR 621 would probably be in the most peril, and thus they headed (in the fire truck) toward that destination.

The two CVFD command officers arrived at the intersection of CR 620 and CR 621, to observe several technical personnel of the local electrical power company working on unrelated [power line] activities, where there also was no fire damage at that location, so they proceeded east a short distance on CR 621.

The Assistant Chief was aware that the pipeline transported highly flammable propane, but what caused what appeared (at that time) to be a substantial rupture and product release, and fully-involved fire, was not apparent at that time, nor was the extent of possible damage to other parts of the pipeline apparent. Accordingly, the truck was stopped just prior to the intersection of the underground propane pipeline (right-of-way) crossing with CR 621, as the two CVFD command officers were hesitant to proceed further on CR 621 with the vehicle, given the uncertainty of what was occurring with the pipeline (i.e. the prospect of further ruptures, explosions, etc.).

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[181] the CVFD Chief was located at that time at his place of business, on the far-opposite side of the explosion site (relative to the location of the Assistant Chief and the CVFD fire station), which also was somewhat of a distance from the explosion site and the CVFD fire station location, where also it was far more expedient for the CVFD Chief to proceed directly to the explosion site.

[182] a 'walkie-talkie' feature of his cellular telephone (as further described in this report; see § 6.8.6.a.).

[183] an attempt was made to make this radio contact, which was initially unsuccessful, due to an apparent malfunction of the Fire Department radio signal "repeater system" (as further described in this report; see § 7.3.1.).

Accordingly, the vehicle was initially staged at that location, which also became the *initial* Forward Command / resource staging location. Additional fire / rescue (mutual aid) apparatus [vehicle] staging was subsequently located at the intersection of CR 630 and CR 632 (i.e. in the parking lot of the Baptist Church at that location), on CR 630 at the Alabama state line (responding AL resources), and on CR 620 at the Wayne County line (responding Wayne County resources).

It was approximately at this time [about 10:55 am] that the two CVFD command officers received word (likely from one of the on-scene Deputy Sheriff officers) that the FD [fire / rescue] radio signal "repeater system" had apparently 'gone-down' (malfunctioned), and pursuant to the [collective CVFD and E911 / Central Dispatch] back-up communication plan, on-scene fire / rescue resources were to switch-over to the Sheriff Department radio frequency (which utilized the Sheriff Department signal "repeater system"). As the CVFD personnel were extremely busy with exigent on-scene activities, they appreciated that a Deputy Sheriff officer would relay (using his Service Radio), a short time later, on their behalf, an 'on-scene / arrival status' report[184] to E911 / Central Dispatch (which apparently occurred at about 10:56, as further described in this report; see § 7.3.1.).

b. Conditions of the Fireground Upon Arrival at the Scene

In arriving at the initial Forward Command / resource staging location, the two CVFD command officers are joined by the CVFD Chief of the Department (who had arrived via his POV). Following CVFD Standard Operating Procedure (SOP), the CVFD Chief assumed operational command of the responding fire / rescue resources, as directly supported by the Assistant Chief and the other responding CVFD personnel. As with the Assistant Chief, the CVFD Chief was aware that the pipeline transported highly flammable propane, but what caused what appeared (at that time) to be a substantial rupture and product release, and fully-involved fire, or the extent of possible damage to other parts of the pipeline was not apparent at that time. The two CVFD command officers were also aware there was another pipeline that traversed the open field in the vicinity of the fire (i.e. a Hunt Oil pipeline, transporting crude oil[185]), and thus given the extent of heavy black smoke, there was some initial uncertainty as to exactly which pipeline was involved, or if both pipelines were involved.

The two CVFD command officers [CVFD Chief and Assistant Chief], in performing a quick / initial 'visual size-up' of the situation, observed several civilians (apparent residents of CR 621, or CR 620 in that area) attempting to help others exit the scene (spontaneous self-evacuations). Several Sheriff's deputies were also observed to arrive at about that time, who also began to assist civilians to exit the scene, and to establish MV traffic control at the west end of CR 621.

A short distance to the east, the burnt-out (destroyed) remnants of several residential dwellings were observed, with several other burning residences observed in the area which were fully engulfed in flames (and thus deemed to be not salvageable given the degree of fire

[184] i.e. a "10-23" Dispatch radio message.
[185] an eight inch diameter pipeline, owned / operated by Hunt Crude Oil Supply Company, intersects with (i.e. passes several feet beneath, at approximately a 90 degree angle to) the Dixie / Enterprise Products pipeline, about 170 feet east of the rupture site.

involvement[186]). Fire had extensively charred the trees and dried-grass in the area, but had essentially self-extinguished in that area[187], and there were several small spot fires in the area although these small fires did not appear to present immediate peril to the remaining civilians (who were evacuating).

In the open field, a distance visually estimated to be about 900 feet to the northeast (from the fire / rescue resource initial staging location on CR 621), there was a large, billowing, uncontrolled fire, which was visually identified to be within the linear boundary of the [propane] pipeline right-of-way. Flames extended into the air a distance estimated to be up to several hundred feet, but which also appeared to be sourcing from somewhat of a single location and didn't appear to be laterally or longitudinally extending a substantial distance beyond that single location (which was later determined to be the trench containing the ruptured pipeline), and the heat generated could be felt even at that substantial distance (~ 900 feet) from the fire.

The fire was assumed (at that time) to be originating from what appeared to be a large rupture in the pipeline, in which a large volume of propane [product] was being released, which (at that time) was also assumed to be the origin of the fuel for the (previously observed) explosion / fire which resulted in the extensive fire damage to the area. Concern also presented regarding the other [buried] pipeline (transporting crude oil) that traversed the open field, although its involvement, if any, was not evident at that time. But the exact pipeline identity was immaterial to the responding CVFD command officers at that time, as the initial actions of the emergency response to a rupture, irrespective of product being released / burning (i.e. propane, or crude oil), would be essentially identical.

There were no structures or other obvious physical entities located proximate to the fire that might be in peril, although (it was later learned) livestock (cattle) had been located proximate to the pipeline rupture site, which had perished or received unrecoverable injury in the explosion / fire. Other livestock (goats and chickens) located in an area immediately adjacent to the rupture site also perished or received unrecoverable injury in the explosion / fire.

With the many downed electrical power lines in that area (as a possible source of ignition sparks from arcing wires), which were in close proximity to the pipeline right-of-way, and given the uncertainty of what was occurring with the pipeline, and that several of the other residences in that area (which hadn't ignited) might still contain occupants, the CVFD Chief immediately issued operational command instructions (to the responding CVFD firefighters) to search the several residences in that immediate area and confirm that the occupants had been evacuated. Given the limited fire suppression resources on-scene at that time and the exigency of completing the evacuation of that immediate area, fire suppression was deferred for the several burning residences that were fully engulfed in flames (which earlier had been deemed not salvageable, such that essentially no material loss resulted by this deferral). The initial evacuation effort focused on residences, and the one-business, located immediately proximate to the on-going fire in the open field (at the pipeline rupture site), which encompassed the area

[186] not salvageable from the perspective that the structure was fully involved with fire, and that a suppression effort at that time was impractical to implement.
[187] foliage in the area was observed to be in somewhat of a "green" (wet) condition, which is suspected to have facilitated the self-extinguishing of the burning trees and dried-grass in the area.

within approximately a ¼ mile radius of the on-going fire site. This was subsequently expanded a short time later, with the support of 'mutual aid' fire / rescue and law enforcement resources, to encompass the area within approximately a one-mile radius of the on-going fire site (later designated as the 'One-Mile Evacuation Zone').

A brief inspection was conducted of what remained of the residential dwellings located at 4195 and 4207 CR 621 (i.e. the locations of the dwellings where the two fatalities occurred), where the remains of two decedents were observed (one at each location). As it was obvious that nothing could be done for the two decedents, and with the fire having already essentially self-extinguished[188] at those locations (and hence no further potential evidence loss would result), the responding CVFD resources moved-on to the other residential dwellings in the area, on the prospect of being able to provide emergency response assistance at those locations.

Upon completion of the initial civilian evacuation (i.e. the area encompassing the ¼ mile radius of the on-going fire site), the CVFD resources, as assisted by mutual aid response resources, began to address (to the extent possible) fire suppression of the burning residences in the immediate area that had not yet self-extinguished. Upon completion of the fire suppression of those burning residences, the CVFD resources then commenced suppression of the several small spot fires that remained in the wooded areas proximate to that location.

Upon suppressing the several small spot fires in the wooded areas, given the prior instructional guidance received (from Dixie / Enterprise Product, regarding fire suppression of such a pipeline fire), pursuant to their On-Scene Tactical Response Plan (as further described in this report; see § 7.3.2.c), no effort was made to extinguish the on-going fire at the rupture site. Accordingly, after a period of time (several hours), with the CVFD having essentially completed as much of the evacuation and fire suppression effort as could be accomplished, CVFD resources (apparatus [trucks] and personnel) withdrew to the intersection of CR 620 and CR 621, which became the final Forward Command / resource staging location, as well as the Incident Command [Post] station. The CVFD resources remained at this location for a period of time, principally on a 'stand-by status' (rotating firefighting personnel with rested crews, as needed), where they were available to respond as might be needed to further address the incident.

Suppression of the fire at the rupture site was achieved the following day with the exhaustion of fuel (propane) in the pipeline, upon closure of the isolation ("block") valves located on both sides of the rupture site and a controlled "burn-off" of residual propane that remained in the pipeline.

Additional information detail of the CVFD Tactical Response Operations is provided in the Emergency Response - Event Chronology ("Timeline") Narrative of this report (see Exhibit 11).

c. On-Scene Tactical Response Plan (Briefly Summarized)[189]

[188] i.e. the combustibles of the structure and contents had been essentially consumed by the fire (at that time).
[189] the points cited are somewhat in the sequence of actual occurrence, although due to the extremely pressing demands of managing on-scene response activities (such that there was no effort expected, or expended, to document same in the field), these Tactical Response points may be slightly out of actual occurring sequence.

- While en route to the scene, request that E911 / Central Dispatch summons appropriate mutual aid resources (i.e. fire / rescue departments, police, emergency management, etc.)[190].
- Upon arrival on-scene, perform a quick / initial 'visual size-up' assessment of the situation (such to be able to safely / efficiently proceed with an appropriate tactical execution of the fire / rescue effort).
- Stage responding fire / rescue vehicles at a reasonably safe location relative to the pipeline (such to reduce risk should an additional rupture / fire occur with the pipeline).
- Perform an initial civilian evacuation process (i.e. those residences within the immediate hazard-threat area; ~ ¼ mile radius of the pipeline rupture), as supported by the initial responding law enforcement officers.
- Upon completion of initial civilian evacuation, address fire suppression of the burning residences in the immediate area (to the extent possible), then address the several small spot fires in the surrounding area.
- Request E911 / Central Dispatch contact the pipeline owner / operator (management service provider), in order to summons appropriate technical resources to the scene.
- Commence to organize an evacuation for a larger geographic area as appropriate for the threat hazard, as identified by consultation of the Emergency Response Guidebook; the distance was subsequently identified to be about a one mile radius [distance] of the pipeline rupture location.
- Local law enforcement, and mutual aid fire / rescue resources to assist with evacuation of the larger (one-mile radius) geographic area.
- Request E911 / Central Dispatch contact MS State Forestry Commission with a request to dispatch fire suppression resources to the scene to address the surrounding woodland areas.
- As the large uncontained fire in the open field to the northeast continued unabated, although intense and uncontrolled, upon recognizing that:
  - the fire appeared to be sourcing from somewhat of a single location (which was later determined to be the trench containing the ruptured pipeline) and didn't appear to be extending a substantial distance laterally or longitudinally beyond that single location, such that the fire remained within the linear boundary of the pipeline right-of-way, and
  - where also, no individuals [humans], structures, or other obvious physical entities proximate to the fire appeared to be in peril, and
  - in which no information was available at that time as to what was occurring with the pipeline (i.e. was the pipeline being shut down, or might there be an unanticipated increase in product flow and thus an increase in fire), and
  - as the fire in the wooded areas proximate to the residential structures in that immediate area appeared to be somewhat self-extinguishing, and
  - given the prior instructional guidance received (from Dixie / Enterprise Products) that no effort should be made to extinguish such a fire unless informed accordingly by Dixie / Enterprise Products officials,

[190] as previously noted in this report, the CVFD Assistant Chief attempted to make this contact, but was initially unsuccessful, due to an apparent malfunction of the Fire Department radio signal "repeater system".

the CVFD command officers resolved that no effort would be made to approach, contain, or otherwise suppress the fire, as the fire was not spreading, and was effectively consuming the released propane product (which preempted concerns over a release of explosive propane gas, which would be of a far greater concern than addressing the existing fire), in which also the CVFD would defer any fire containment / suppression [tactical response] until receiving guidance from technical resources of the pipeline owner / operator and/or management service provider (Dixie / Enterprise Products).

- Following instructional guidance received from technical resources of Dixie / Enterprise Products, suppression of the fire would be achieved by the exhaustion of fuel (propane) in the pipeline, as accomplished by closure of the isolation ("block") valves on both sides of the rupture site and a controlled "burn-off" of residual propane that remained in the pipeline.
- as a precautionary measure, before deactivating to a 'stand-by status' (noted below), manual closure [by CVFD personnel] of all gas flow valves on the residential (propane fuel) storage tanks located within the immediate area (i.e. approximate a ¼ mile radius) of the pipeline rupture site, until the controlled "burn-off" of residual propane was completed.
- Given the continued propane [product] release (while the fire still burned), concern presented over ambient air quality, in that the CVFD was not equipped with propane gas detection equipment (air quality meters), although the CVFD Chief was not overly concerned with this, in that he recognized that as long as the fire (at the pipeline rupture site) continued to burn, an accumulation of propane was not likely, as the initially released propane had probably been fully consumed during the initial explosion, and the propane that continued to release would probably be burned-off in the ongoing fire.
- Upon completing evacuation / fire suppression activities (to the extent possible), and in relocating to the resource staging location (Incident Command Post), CVFD resources would stand-down (to a 'stand-by status'), where firefighting personnel would be rotated out / in with rested crews, as needed, where the CVFD would also be available to respond as might be needed to further address the incident.

d. The Evacuation[191]

As noted above, several civilians (residents of CR 621, proximate to the on-going fire in the open field) initiated spontaneous self-evacuations immediately subsequent to the explosive ignition and ensuing fire. The organized evacuation process commenced shortly thereafter upon on-scene arrival of CVFD resources, as supported by responding fire / rescue mutual aid resources, with additional support from responding law enforcement resources. The initial evacuation focused on residences, and the one-business, located immediately proximate to the on-going fire in the open field (at the pipeline rupture site), which encompassed the area within approximately a ¼ mile radius of the on-going fire. The evacuation was subsequently expanded, a short time later, to encompass the area within approximately a one-mile radius of the on-going fire site (which was subsequently described as the 'Evacuation Zone'). The evacuation zone was further expanded for a short period of time to about a two-mile radius of the accident site, which was suspended a short time later (upon determination that a one-mile radius was sufficient).

[191] as further described in this report; see § 7.6.1

A map describing the One-Mile Radius Evacuation Zone is provided in Exhibit 12.

e. On-scene Activity Conclusion

On-scene activities continued until fire suppression (residue product burn-off) and evacuation activities were fully concluded, and a law enforcement presence at the site was deemed necessary only to provide site-security of the fire-destroyed residences (on CR 621), at which time the Incident Command post was relocated to a site proximate the pipeline excavation location (a vacant field off CR 630, to the north of the rupture site). Incident Command activities concluded at the relocated site on November 4, at about 16:00 hrs, which essentially concluded on-scene activities for the Incident Command process[192].

7.3.3 Mutual Aid – Wayne County Fire Department Resources[193]

Responsive to the 9-1-1 call received by the Wayne County – Emergency Call Center / Emergency Services Dispatch (commencing at 10:42:50, and concluding about 2 minutes later), Wayne County 9-1-1 / Central Dispatch commenced to respond police resources (a Wayne County Sheriff deputy, at 10:45:47) toward the identified location to investigate and report back [to Dispatch] a more precise location / description of the reported incident. Then, upon receiving a 2nd 9-1-1 call and then a 3rd 9-1-1 call shortly thereafter, both calls reporting similar information, and a report from the dispatched Sheriff deputy that the incident source visually appeared to be in Clarke County (to the immediate north of the Matherville community), , commencing at about 10:59 am, fire / rescue resources were dispatched to the scene ("toned-out"). Performed as (an anticipated / proactive) 'mutual aid' response to the scene, this initially consisted of three engines [fire trucks and crews], and appropriate fire / rescue command officers and other personnel, and was subsequently expanded to other fire / rescue resources within Wayne County (e.g. City of Waynesboro). The 1st of the Dispatched Wayne County fire / rescue resources [i.e. Matherville FD] arrived on-scene at about 11:18, and provided 'mutual aid' support to the CVFD (the resources of which were already on-scene). The other dispatched Wayne County FD units subsequently arrived on-scene a short time later, also to support the CVFD (as further described in this report; see Exhibit 11 - Event Chronology "Timeline" Narrative).

7.3.4 Law Enforcement Tactical Response - Clarke County Sheriff Department[194]

At about 10:44, the Clarke County Sheriff, who happened to be at his residence at that time[195], received a phone call from Clarke County – E911 / Central Dispatch, inquiring if there were any pipelines around County Road 630 and 621, as E911 / Central Dispatch had just received a report

[192] several of the Incident Command staff remained at the relocated site for several days thereafter, to continue to monitor the site and provide logistical support, where on-going pipeline removal / replacement activities continued for those several days.
[193] source: CAD Incident Report documentation supplied by Wayne County 9-1-1 Emergency Call Center / Emergency Services Dispatch, and interviews of principals of that agency and corresponding [Wayne County] fire / rescue agencies.
[194] source: Clarke County Sheriff; on-scene, and subsequent interviews, and contributed documentation.
[195] located an estimated 20 miles from the pipeline explosion site.

[a 9-1-1 call] of an "explosion" in that area, in which the Sheriff responded that there was a pipeline that ran through the Carmichael area. The Sheriff [later] noted that he had been listening (casually) to his Service Radio [just prior to this phone call], but when he received this phone call, there was no radio traffic about an incident occurring in the Carmichael area. E911 / Central Dispatch advised the Sheriff that two Units [Deputies] had been dispatched to that location and the CVFD had been Paged-out to respond, in which he concurred, and the Sheriff indicated that he would begin closer monitoring of radio traffic for potential activity updates.

A short time later, in further monitoring his Service Radio, upon not hearing a radio transmission response from the CVFD, or any other fire / rescue agency for that matter (acknowledging the fire / rescue Page-out, and an indication that a response to the scene had been initiated), the Sheriff suspected that the Fire Department radio signal "repeater system" must have failed to transmit for some reason. Accordingly, at what is estimated to be about 10:55, responsive to the apparent radio signal "repeater system" malfunction, as he was not able to directly contact the Clarke County – E911 / Central Dispatch (due to limitations on Sheriff Department service radio signal transmission range), the Sheriff contacted one of his Deputies (who was within transmission range of the Sheriff's hand-held radio), with a request that the Deputy notify E911 / Central Dispatch that the fire / rescue radio signal "repeater system" appears to have failed / malfunctioned, with instructions for them to, pursuant to the E911 / Central Dispatch back-up communication plan, switch their radio broadcast communications channel over to the Clarke County Sheriff Department radio signal "repeater system" (for further radio communications with the fire / rescue agencies)[196].

The Sheriff then expeditiously proceeded, in his POV (which did not have a built-in Service Radio), toward the reported scene of the explosion, issuing Dispatch instructions (using a hand-held[197] service radio) to his Deputy Sheriff staff (i.e. those who happened to be within radio signal range), while en route, to respond to the site.

At what is estimated to be about 11:15, the Clarke County Sheriff arrived proximate to the intersection of CR 620 and CR 621 (which would become the Incident Command [Post] location), and pursuant to the Clarke County Comprehensive Emergency Management Plan, began to organize and implement what would evolve into Incident Command for the incident. The Sheriff proceeded to implement an Incident Command process, and assumed the role as Incident Commander, which was subsequently elevated to a Unified Command System (as further described in this report; see § 7.4).

[196] neither an audio record in the recorded radio or telephone call [audio] channels, nor a notation (of this communication) in the Dispatch Log Sheets was found, although it's possible that this call was made using a non-recorded cell phone, or administrative phone line of E911 / Central Dispatch, and this item was inadvertently omitted due to the activity burden occurring at that time.

[197] as a general observation, hand-held service radios have a somewhat limited transmission range, although they can communicate directly with other (nearby) hand-held radios, as well as a "base-station" radio unit (as might be located at a fire station, or the County Communication Center).

7.3.5 Post-Event Internal Critique / Debriefing - Retrospective Observations, Considerations, and Potential Initiatives – All Emergency Response Agencies[198]

- Concern had presented [on-scene] with principals of the fire / rescue effort, over ambient air quality resulting from the continued propane gas release (as further described in this report; see § 7.3.2.c), which was also substantially obviated by the consideration that released propane gas was being successfully / safely eliminated (burned-off) in the on-going fire. However, the CVFD Chief and Assistant Chief recognized that the responding emergency services resources could have been at a significant disadvantage in not being equipped with propane gas detection equipment (air quality meters) during the initial response to the scene, had the released propane gas not fully burned-off in the initial explosion and subsequent ongoing fire, or if the propane gas release was of a much smaller volume (i.e. was less-visibly obvious), such that propane gas accumulation might have occurred in low-lying areas near the site, potentially placing individuals [civilians / firefighters / law enforcement] and properties in those areas in peril. Prior procurement of such air quality meters was not seen as a pressing necessity by the CVFD, as there had not been a *demonstrated need* for such equipment in the 45+ years of uneventful pipeline operation, the purchase of which was also a budgetary consideration (i.e. why buy a piece of specialized equipment which might never be needed / used ?). Accordingly, given the experienced gained in this event, the CVFD, with the prospective support of the pipeline owner / operator - management service provider, will be considering procurement of such air quality monitoring equipment, so to be better prepared in the event of a future propane gas release.

- Difficulty was experienced by some responding firefighters (arriving at the scene in their POV's) in passing through roadway blockades (at the evacuation radius delineation points) in order to access the scene, because of an inability of the firefighters to provide acceptable identification credentials, to validate their affiliation with a legitimate fire / rescue agency to law enforcement officers (stationed at the roadway blockades). Such access by responding firefighters during a relatively small / localized incident (in which only local firefighters would be responding) is normally not a problem, in that officers of the local law enforcement and fire / rescue agencies usually visually recognize each other on-sight, and hence identification credentials are not warranted. The difficulty occurs when local law enforcement officers staff the roadway blockades, who don't visually recognize, on-sight, responding 'mutual aid' firefighters (from outside the immediate area); an obstacle that's obviated by issuance of recognized identification credentials. Both local law enforcement, and the local fire / rescue agencies, in recognizing this was a relatively minor, but sometimes a necessary measure in the site security access process (obviously, unauthorized individuals need to be excluded from site access), where it's also recognized that it would be to the collective advantage of the emergency response process that this issue be acceptably addressed to the satisfaction of all parties involved. Such identification credentials would also be beneficial to Incident Command in the implementation of *on-scene accountability*

[198] source: observations expressed to NTSB by the individual emergency response agencies, as identified during the NTSB debriefing interview process, and as identified in Post-Event Internal Critique (After-Action) sessions conducted by the individual emergency response agencies, in which also the noted observations are presented here in no particular sequence order.

efforts [of emergency response personnel] [199], and thus would also useful to all of the fire / rescue agencies in Clarke County. Accordingly, to help resolve this, both entities mutually advocated ameliorating such difficulties with a reasonably workable solution. Consequently, both parties were pleased to report that, through the efforts of the Sheriff Department and the Clarke County Board of Supervisors, appropriate identification credentials have been now been issued to authorized [firefighting] personnel of the CVFD, which was subsequently extended to all authorized [firefighting] personnel of all the Clarke County fire / rescue agencies, which thus successfully resolves this matter.

- At the onset of the event, before the circumstances of the propane release were fully recognized (where the large fireball plume and a pronounced cloud of heavy black smoke strongly suggested to Incident Command that the rupture had occurred in the crude oil pipeline), a reference was inadvertently made by Incident Command during a press briefing (to the effect) that the rupture had occurred in the crude oil pipeline, where it was subsequently determined that the rupture had occurred in the propane pipeline. In retrospect, at press briefings, Incident Command will endeavor to present the recognized facts, as available at that time, in a manner that more easily allows a revision of the facts as they become available. In this incident, for example, such a presentation of the facts might indicate (to the effect) that in an area close to where two buried pipelines intersect (i.e. one pipeline is buried a distance beneath the other, where they don't actually connect with each other), a rupture of at least one of the pipelines has apparently occurred, which has resulted in an on-going fire at that location, and that a determination could not yet be made as to exactly which pipeline was involved, or if both were involved, given the close proximity of the fire to the location of the pipeline intersection, and that an update will be forthcoming as soon as the pipeline identity can be confirmed.

- Principals of the Clarke County Government and emergency services agencies[200] expressed (to the effect) that Clarke County normally was able to conduct routine law enforcement and fire / rescue mobile communications using their existing fire / rescue and Sheriff Department radio signal "repeater system" infrastructures, and established communications backup systems / procedures. However, large-scale, critical emergency incidents, such as occurred with the pipeline rupture and subsequent explosion, that require an all-hands / mutual aid emergency services response, can severely tax and challenge their communications infrastructures, which also demonstrates some vulnerabilities of their current mobile communications systems. As was demonstrated in this incident, Clarke County is able to substantially overcome the challenges that presented, by employing their backup communications systems / procedures, although having a fully functioning mobile communications system that's not subject to intermittent 'transmission range limitations', or inadvertent / unanticipated / unscheduled equipment [apparent] malfunctions or shutdowns,

[199] 'on-scene accountability' an administrative mechanism [tool] available to Incident Command, whereby certain emergency response field personnel, while performing 'relatively high-risk' on-scene duties (e.g. fire suppression, a hazardous materials response, rescue efforts, etc.), are 'actively tracked' (on a 'tracking board', or by similar method) in order to be able to promptly identify where an individual is physically located at any given moment, to help assure that the individual is not inadvertently placed at an 'elevated level' of risk while performing 'relatively high-risk' on-scene duties.

[200] Clarke County Sheriff, Clarke County Communications Director, and a member of the Clarke County Board of Supervisors

does help assure that the Clarke County emergency services agencies are able to efficiently / effectively address all routine, as well as unanticipated large-scale / critical emergency incidents, as might occur within their jurisdiction. Accordingly, responsive to the challenges that presented in this incident, as interim and potentially permanent measures, the Clarke County government:

- has employed equipment and procedural enhancements for the Clarke County Communications [agency][201] (e.g. has implemented a hardware modification to help prevent future inadvertent / accidental disconnections of the communications cables, and now conducts bi-weekly tests of the fire / rescue Dispatch Pager System), will endeavor to better coordinate with the technical maintenance contractor of their Service Radio communications equipment, and will implement additional appropriate procedural revisions or enhancements for the Communications [agency], as might be presented or recognized, to the extent possible, and
- has advocated to improve Clarke County mobile emergency services communications, to the extent possible and allowing for budgetary considerations, by exploring the possible procurement of infrastructure enhancements, as might be presented or recognized (e.g. installation of additional strategically located radio signal transmission / receiver towers, or obtaining more reliable / stronger [distance transmitting] radio signal "repeater system" equipment), such to help to overcome the prospect of intermittent 'transmission range limitations', or inadvertent / unanticipated / unscheduled equipment [apparent] malfunctions or shutdowns.

▫ A number of the [fire / rescue] Senior Command Officers of the various local emergency response agencies, both within Clarke County and the adjacent jurisdictions (who provided 'mutual aid' support to the event), privately expressed[202] concern and consternation to the Investigation, about not having a large-scale, easily assimilated, single-source, map documentation, that provides essential information detail on the individual pipelines that comprise the extensive network of hazardous liquid and gas transmission pipelines, which traverse not only Clarke County[203] and the adjacent Counties, but the entire State of Mississippi, and adjacent States as well. As background, within their [fire protection] jurisdictions, most local emergency responders have a reasonably well-informed familiarity of the individual transmission pipeline locations, products conveyed, and corresponding [adverse event] hazards, in which such familiarity is principally based upon documentation that has been made available by the pipeline owner / operators (or their training contractors) during participation in "Government Liaison - Emergency Response Program" emergency responder familiarization events (as further described in this report; see § 6.9.1.g) or other training activities, as also potentially supplemented by information cited in 'warning marker' signs placed along the individual pipeline the right-of-way locations. As depicted by principals of the emergency response agencies, the maps supplied through the "Government Liaison - Emergency Response Program" consisted principally of poor quality, small-sized

[201] as further described in this report; see § 7.9.2 and § 10.4.1.
[202] the Senior Command Officers preferred to remain anonymous in offering this collective observation
[203] the investigation identified that Clarke County contained at least 10 hazardous liquid and gas transmission pipelines (as described in, and for further information, see [Internet] http://www.npms.phmsa.dot.gov/publicsearch/Attribute.asp?AreaType=COUNTY&AreaValue=28023).

(8½ x 11), multiple-paged maps, which are not particularly well organized and are not in a 'user-friendly' format (e.g. separate maps provided for each individual pipeline operation, which are of different scales and have different operational [feature] nomenclatures, etc.). Although certainly better than having incorrect or no information at all, reliance on such documentation is not optimum for expedient field use during an exigent emergency response to an adverse pipeline event. Also, in not having accurate information instantly available, Command Officers might be pressed into executing decisive 'command decision' tactical response actions based upon misunderstood or misread information, or (even worse) 'educated guesses' based upon 'best-recollection' / 'good-faith' efforts, which places the personnel of the emergency response agencies at a distinct disadvantage, which also, in a worst-case scenario, could obviously result in catastrophic consequences. Accordingly, to address and remedy the above, a number of the Senior Command Officers have requested of the pipeline owners / operators that appropriate detailed map information be made available to their jurisdictional emergency response agencies, in a digital format where it could be readily incorporated into a commercially available, digital-format, large-scale [wall-size] topographical map, and hence easily printed-out by the emergency response agencies on a county-wide basis (to take advantages of 'economies of scale'). Such detailed pipeline information might include, for example, [transported] product name and [hazardous materials] identity codes[204], pipeline company [owner / operator] name and business address, emergency contact information, exact [surveyed] routing locations, pipe size [diameter], approximate soil coverage depth, typical - pressure / volume flow-rate / flow direction, and pump station and block valve locations. Having such a resource, containing detailed information about the individual transmission pipelines in the County in a convenient, easily assimilated, single-source document, is envisioned to be a particularly useful tool, to be strategically placed in the jurisdictional fire / rescue stations, law enforcement offices, emergency communication [fire and police radio] offices, etc.[205], such to be available as a ready-reference information source for emergency response Command Officers during an adverse event involving any of the identified pipelines. Responsive to the data request, a number of those pipeline owners / operators have refused to make that accommodation [detailed data on their pipelines] available, where they have also represented 'security considerations' in that refusal.

7.4 Incident Command

Pursuant to the Clarke County Comprehensive Emergency Management Plan, the Incident Command process was initiated by the Clarke County Sheriff upon his arrival on-scene, who, pursuant to the Clarke County Comprehensive Emergency Management Plan, assumed the role as Incident Commander, as supported by the Clarke County Emergency Management Director.

Pursuant to the Clarke County Comprehensive Emergency Management Plan, notifications were made to the designated mutual aid law enforcement agencies, which commenced to respond resources to the scene.

[204] identity codes were indicated to be very useful in expediting the identification of the detailed release exposure / safety handling guidance information provided in the Emergency Response Guidebook.
[205] where, to address 'security considerations' of the pipeline owners / operators, access to such map documentation would also be limited to appropriate emergency response personnel, as justified on a "need to know" basis.

Also pursuant to the Clarke County Comprehensive Emergency Management Plan, an assumption was initiated by Incident Command that the site would be a "crime-scene" until a determination was made to the contrary. This afforded Incident Command the ability to initiate certain site security provisions as might be appropriate to effectively / efficiently manage a crime scene. Corresponding to this, however, was the consideration that, at the onset of the response to an incident such as this, the Incident Commander would defer the direct management [command] of all fire suppression and hazardous rescue operations entirely to the responding fire / rescue agencies (who would establish their own command structure to manage that element of the emergency response effort), as they were obviously better equipped / trained for such endeavors.

Accordingly, at the onset of the response to the incident, the Incident Commander deferred the management of fire suppression activities to the CVFD, as supported by responding mutual aid resources. The evacuation process was being performed by resources of the CVFD, as supported by responding fire / rescue mutual aid resources, with additional support from responding 'mutual aid' law enforcement resources (as further described in this report; see § 7.6.1).

Site perimeter security (i.e. establishment and staffing of roadway blockades at the evacuation radius delineation points) was performed by uniformed officers of the various responding local, and mutual aid, law enforcement agencies.

As the incident progressed, upon completion of the initial fire suppression effort and evacuation process, and upon stabilization of the incident, pursuant to the NIMS protocol[206], the command structure was subsequently elevated by the Incident Commander, to a Unified Command System to better manage the event.

With fire suppression activities completed, where the CVFD withdrew to a stand-by status and essentially all responding fire / rescue mutual aid resources were released from the scene, the Incident Command role consisted basically of managing site access control (i.e. oversight of the staffing of roadway blockades at strategic locations [proximate to the accident site] by law enforcement resources, to prevent unauthorized entry), as further described in this report (see § 7.6.1 and § 7.6.2).

7.5 Air Quality Monitoring[207]

In a release of a toxic / explosive product from a ruptured pipeline, an integral element of an emergency response and evacuation process is the monitoring of air quality for the area proximate to the accident site, with the information then made available for contemporaneous dissemination to Incident Command (staff) and the jurisdictional air quality monitoring agency (in this event, the MSDEQ), such to allow informed decisions to be made as support to the execution of the emergency response to the incident.

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[206] an Incident Command element, promulgated under the US DHS / FEMA, as described in [a document titled] National Incident Management System (see [Internet] http://www.fema.gov/pdf/emergency/nims/nims_doc_full.pdf)

[207] source: field interview of, and field notes [containing the air quality monitoring data] made available by, the responding technical staff-person of Enterprise Products, who is also the Survival Factors Group / Party to the Investigation, designated representative for Dixie / Enterprise Products

Responsive to concern expressed (on-scene) by the MSDEQ, basic air quality monitoring in this incident was initially performed by a responding technical staff-person of Enterprise Products, which commenced on November 1 at about 6:45 pm and concluded about 7:10 pm. Air quality samples were taken at a sampling location proximate to the intersection of County Roads 620 and 621[208], the data collected of which was contemporaneously disseminated to Incident Command and the MSDEQ. The resulting data indicated (to the effect) no flammable gas [propane] content in the air sampled (i.e. continued H_2S readings of 0.0, and continued LEL readings of 0.0), and the level of combustion byproducts in the air sampled was within US EPA[209] [identified] permissible limits[210] (i.e. observed normal O_2 levels and continued CO readings of 0.0).

Subsequent, more sophisticated air quality monitoring was performed for the MSDEQ commencing on November 2, at about 4:30 am, by a responding environmental technical contractor (CTEH® [211]), and concluded on November 3, which was taken at multiple sampling locations [stations] proximate to the rupture site, the data collected of which was contemporaneously disseminated to Incident Command and the MSDEQ. The resulting data was compiled by the responding environmental technical contractor (CTEH®) in an 'initial data report' document[212], which was subsequently made available to the investigation. Additional (final) report documentation by this environmental technical contractor, which includes the data as provided in the 'initial data report' document, was received by the Investigation[213], a copy of which is to be included in the NTSB public docket.

7.6 Civil Restrictions and Declarations, Commercial Closures, and Evacuation Support[214]

7.6.1 Evacuations Implemented / Site Access Restrictions

The responding CVFD Chief, as supported by the CVFD Assistant Chief, shortly after arrival on-scene and upon the immediate recognition that individuals located immediately proximate to the fireground were potentially in imminent peril (because of a severe hazard threat from potential residue propane gas that had not ignited, which might subsequently ignite without advance warning), directed the responding resources to initiate an expedited evacuation of those residences and the one business in the immediate vicinity of the accident site (i.e. all of County Road 621, and a portion of County Road 620 proximate to the intersection with County Road 621). This encompassed an area bounded within about a ¼ mile radius of the pipeline breach. Commencing almost immediately thereafter, law enforcement resources (as requested to respond to the scene) implemented roadway blockades at strategic locations proximate to the accident

[208] this air-monitoring site was also proximate to the Incident Command site.
[209] U.S. Environmental Protection Administration.
[210] ref. [Internet] http://www.epa.gov/air/criteria.html.
[211] for further information, see [Internet] http://www.cteh.com/
[212] CTEH® report document ref. "Dixie pipeline Propane Fire, Quitman, MS, Clarke County, … [as] Prepared for NTSB, [dated] Nov. 8, 2007".
[213] CTEH® report document ref. "United States Environmental Services, Clarke County, Mississippi, … [as] Prepared for: United States Environmental Services, [dated] Dec. 11, 2007".
[214] source: CVFD; on-scene, and post-scene interviews.

site, at the approximate perimeter limits of the area bounded within the ¼ mile radius, to prevent unauthorized entry into the site.

A short time subsequent to the expedited evacuation of residences and a business in the immediate vicinity of the accident site, the evacuation zone was enlarged to an area bounded within approximately a one-mile radius of the accident site, as assisted by supporting Mutual Aid fire/rescue and law enforcement resources. The evacuation zone was further expanded for a short period of time to about a two-mile radius of the accident site, which was suspended a short time later (upon determination that a one-mile radius was sufficient).

For the residences and the business located immediately proximate to the accident site (i.e. within the ¼ mile radius of the fire location), the evacuation process was substantially completed in less than about 30 minutes of initiation, with the evacuation process continuing for residences located further distances from the accident site (i.e. up to the one-mile radius [delineation point] of the accident site), which was completed within about one hour of initiation.

An estimated 60 residential dwellings located within a one-mile (evacuation) radius of the accident site were evacuated, containing an estimated population count of about 200 resident individuals. Other than a few commercially operated poultry hatchery / egg production, or related facilities, which have a relative few employees, no other commercial establishments are located proximate to (i.e. within about a one-mile radius of) the accident site.

The evacuation was concluded (terminated / lifted) by the Clarke County Sheriff's Department and Clarke County Emergency Management, commencing at about 7:20 pm on the evening of the incident (November 1) for residences and the one business (in the area) that were not located immediately proximate to the accident site (i.e. all areas except County Road 621 and the east side of County Road 620). The evacuation continued until 10:00 am the following morning (November 2) for the residences located immediately proximate to the accident site (i.e. on County Road 621 and the east side of County Road 620).

Site security (by law enforcement) continued for several days on County Road 621 due to the ongoing investigation activities at the pipeline rupture site, and subsequent pipeline repair (replacement) efforts.

7.6.2 Emergency Highway Traffic and Site Access Management

a. Local Roadway Closures

Commencing almost immediately after responding emergency services resources initiated an expedited evacuation of residences and the one business in the immediate vicinity of the accident site, law enforcement resources (as requested to respond to the scene) implemented roadway blockades at strategic locations proximate to the accident site to prevent unauthorized entry into the site (i.e. all of County Road 621, and County Road 620 proximate to the intersection with County Road 621). Further, upon commencing the one-mile radius evacuation (which essentially was an enlargement of the evacuation area that was initiated at the onset of the incident), law enforcement resources established roadway Traffic Control Points outside the one-

mile radius buffer zone proximate to the accident site, restricting access to all except authorized personnel (i.e. emergency responders, law enforcement, authorized hazardous materials release mitigation contractor and/or pipeline personnel, authorized local / state / federal officials, etc.).

b. Limited / Controlled Reentry to the Site

Upon a determination that a limited / controlled reentry of civilian individuals into the one-mile radius buffer zone could be initiated, law enforcement resources, as sometimes assisted by available Fire / Rescue resources, later escorted civilians who needed to return to their residences for short time intervals (e.g. to attend to pets, obtain personal effects, etc.).

7.6.3 Aviation Flight Restrictions[215]

None initiated or required.

7.6.4 Commercial (Manufacturing / Retail) Facility Closures

None initiated or required[216].

7.6.5 Emergency Shelter / Sustenance Activities – Responsive to the Incident

The Carmichael Community Center, located near the Carmichael fire station, was opened a short time after the explosion and staffed by the CVFD Ladies Auxiliary, which was available to receive displaced / evacuated individuals (situated within a one-mile radius evacuation zone) who were unable to organize / utilize their own relocation resources.

The American Red Cross sheltered about 14 families in local hotels the evening of November 1.

Dixie / Enterprise Products responded Claims Agent personnel to the scene, which received / processed damage claims submitted by the local population, and which made financial resources[217] available to some of the displaced civilians who had incurred out-of-pocket expenses as a result of the incident.

The Carmichael Community Center remained open for about one week, which also served as a temporary duty station for American Red Cross staff, and Dixie / Enterprise Products administrative staff who were receiving / processing damage claims submitted by the local population.

7.7 Responding Emergency Services and Tactical Support Resources

The investigation identified a total of about a dozen responding emergency services agencies and organizations (i.e. jurisdictional and mutual aid fire departments, medical response [ambulance],

[215] i.e. Temporary Flight Restrictions (TFR's) as promulgated under 14 CFR 91.137.
[216] i.e. none, other than a temporary evacuation of operating personnel at a poultry production facility located at the intersection of CR 620 and CR 621, which (reportedly) did not significantly impair operations at the facility.
[217] e.g. small cash payments, prepaid Walmart [monetary remuneration] Cards, etc.

emergency management agencies, etc.), about eight law enforcement agencies, about four [state / Federal] government response agencies (e.g. MEMA, PHMSA, NTSB, etc.), and four commissary support organizations (i.e. CVFD Ladies Auxiliary, Red Cross, etc.) responded to the event. Response to the incident involved participation by (what is estimated to be) at least several hundred individuals of the various local, county, state, and Federal organizations and agencies that responded, of which at least 50 of these responding individuals were firefighters.

A list of responding emergency services agencies (local and mutual aid), support organizations, and governmental agencies that responded to this accident is provided in Exhibit 13.

7.8 Other Investigation Information Sources

7.8.1 Witnesses Interview Testimony

Utilizing a list of individuals / families that were temporarily displaced during the evacuation process[218, 219], the Survival Factors [working] Group conducted a number of individual interviews during the on-scene phase of the Investigation, as well as performed a door-to-door canvas of the locale proximate to the accident site (to the extent possible), in an effort of identifying prospective witness candidates to the pipeline rupture, or the immediate aftermath. As further follow-up, telephone inquiries were subsequently placed to several prospective witnesses for that same purpose.

A summarization of significant information obtained in the witness interview process is available (in the public docket) in a separate Addendum to the Survival Factors Factual Report of the Investigation ("Witness Interview Notes"). Key information of the identified witnesses is also included in this report (see Exhibit 11 - Event Chronology "Timeline" Narrative).

7.8.2 Video (Security Camera) Documentation

During the on-scene investigation, Safety Board staff attempted to locate property locations proximate to the accident site[220] that might have maintained (continuous / automatic) surveillance camera / video monitoring and recording equipment, which coincidentally might have recorded audio / video images of the pipeline rupture, or the aftermath.

The search effort resulted in no video surveillance / security cameras being identified (as there were no commercial establishments proximate to the accident site). A civilian witness was located (i.e. during the witness interview process, as described in § 7.8.1), who had recorded a videotape of the event aftermath (albeit, at a distance, using a hand-held video camera, which commenced an estimated 15 minutes after the explosive ignition of the propane gas had occurred), a duplicate copy of which was made available to the investigation.

[218] list obtained from the local chapter of the Red Cross (an agency which helped in the administration of the evacuation shelter utilized in the event).
[219] which included residents of the damaged / destroyed dwellings in the 4100 and 4200 block of County Road 621.
[220] as might be typically located at commercial [retail business / manufacturing] facilities in the area.

7.9 Apparent Malfunction of Service Radio Signal "Repeater System" [221, 222]

7.9.1. Response of the Technical Maintenance Service Contractor

Investigation into the specific cause of what the Clarke County – E911 / Central Dispatch identified as an apparent malfunction of the Fire Department radio signal "repeater system", revealed that the technical maintenance service contractor[223], upon receiving a call from the E911 / Central Dispatch (at about 11:01 am) to report the problem and request an urgent service call (to get their system back on-line), responded, on a priority basis, a Service Technician to address the complaint. Arriving (in his vehicle) at the location of the 'remote computer servers' [Clarke County Jail] at about 11:40, as a first step of the diagnostic process, the Service Technician "reset the tone remotes and radios", which was completed within a few minutes. The Service Technician then responded to the E911 / Central Dispatch facility (at the Courthouse, where the call-processing [computer based] communications console equipment is located), to further diagnose the problem (arriving at about 11:52). Upon examining the equipment at the E911 / Central Dispatch office, the Service Technician found that the radio signal "repeater system" had not actually failed, although to the E911 / Central Dispatch operating personnel, it had displayed all the indications that it had somehow suddenly malfunctioned.

In diagnosing the equipment status, the Service Technician found that several "snap-in" style connector fittings, which are attached to the ends of several communication cables of the Service Radio communication system, which (separately) connect the call-processing [computer based] communications console[224] to both the radio signal "repeater system", and to the automatic audio recording equipment[225], had been dislodged (separated) from their corresponding connection sockets. This disconnection resulted in no Dispatch Radio signal being communicated to the Fire Department "repeater system" equipment (and hence, the Dispatch Page messages sent to the individual [community] fire / rescue agencies were not actually transmitted), and also resulted in some of the radio [audio] channels not to be recorded by the automatic audio recording equipment. E911 / Central Dispatch operating personnel were not aware that the connector fittings had separated from the connection sockets. The connector fittings were manually reinserted by the Service Technician into the corresponding connection sockets, and the radio signal "repeater system" went back on-line (became operational) at about 11:57 am[226].

The Service Technician then, in an effort assuring normal Service Radio system performance, and to identify approximately when the system malfunction occurred, monitored the

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[221] source: [statement] documentation supplied by the technical maintenance service contractor of the Clarke County Service Radio system, and informal interview of the responding [maintenance contractor] Service Technician.
[222] as affirmed by the Director of the Clarke County Communications [Agency], who represented that the content of this report [section] narrative accurately reflect the facts of the event (as described), to his best knowledge, recollection, and familiarization.
[223] Comsouth, Inc., 1712 Highway 19 N., Meridian, MS 39307 (which is about 24 miles north of Quitman, MS).
[224] which, basically described, contains the 911 call-processing equipment and the Dispatch Service Radio System
[225] which records the 911 telephone calls, and fire / rescue, police, EMS - Dispatch radio channels
[226] this activity is time-sourced from interview information of the [radio system maintenance contractor] Service Technician, in which the Dispatch Log Sheet notation of this activity [of ~11:55] was subsequently determined to be inaccurate by several minutes (possibly due inadvertent errors in manually recording the time by E911 / Central Dispatch personnel, as further described in this Report; see § 6.8.2.b). Also, no audio record (of this activity) was found in the recorded radio [audio] channels.

'surveillance tapes' and completed some performance assessment work on the system before departing the E911 / Central Dispatch facility. The Service Technician indicated that the E911 / Central Dispatch communication system was returned to full performance at about 12:15 pm. As the communications system was fully operational, there was no need to further examine the radio signal "repeater system" equipment (which is located at the transmitter / receiver tower facility).

Performance of the Sheriff Department Service Radio signal "repeater system", which functions separately to that of the fire / rescue radio signal "repeater system, was not impacted by the disconnection of the communication cables, and continued to function normally throughout the malfunction of the Fire Department / Dispatch - Service Radio system.

To briefly summarize the apparent sequence of events, and contributing factors that preceded the 'apparent malfunction' of the Fire Department radio signal "repeater system":

- the cable connectors were apparently inadvertently dislodged at about 9:00 am, and as the cable connectors were not in a location that was visibly obvious to E911 / Central Dispatch operating personnel, the connector disengagement went unnoticed by the operating personnel.
- as the fire / rescue radio channel had not been utilized[227] in the time interval between about 9:00 am and the time when the [pipeline rupture] event was first reported to Clarke County 9-1-1 (a call which was identified to commence at 10:39:56, resulting in the initial [attempted] Dispatch Page to fire / rescue [CVFD] about two minutes later), and as E911 / Central Dispatch does not have the capability to continuously monitor radio signal continuity with the (remotely located) "repeater system", the system malfunction was not detected by E911 / Central Dispatch operating personnel during that time interval.
- the loss of the radio signal transmission (to the "repeater system") went undiscovered by E911 / Central Dispatch operating personnel until about 10:55 am, when, after having placed several dispatch Pages to the individual [community] fire / rescue agencies (in which no acknowledgement responses were received), E911 / Central Dispatch operating personnel then suspected that some sort of "repeater system" malfunction must have occurred, and immediately engaged their 'back-up Service Radio communication plan', and used the Sheriff Department "repeater system" for further contact with the fire / rescue agencies.
- upon the cable connectors being reconnected (by the Service Technician, at about 11:57 am) and after other diagnostic steps were performed (to help assure no other undiagnosed problems prevailed), the E911 / Central Dispatch Service Radio Communication System was returned to full performance (by the Service Technician) at about 12:15 pm.

7.9.2 Suspected Disconnection Cause and Remedial Measure Implemented

The suspected cause of the separation of the cable connectors from the sockets was traced to the apparent use of a floor mop, which had been used (at about 9:00 am that morning[228]) during routine housekeeping (floor cleaning) of the area behind the Service Radio 'equipment rack' (shelf) that housed the communication equipment and cables (an area which is also out of normal

[227] as verified by review of the E911 / Central Dispatch - Radio Station Log Sheets for that day.
[228] based upon the (approximate) time that the [radio system maintenance contractor] Service Technician observed [in the 'surveillance tapes'] that the audio recording had ceased.

visibility), where the subject cable connectors appear to have been inadvertently dislodged upon being contacted by the mop, in which also the dislodging of the cable connectors was not apparent to the individual who was using the mop.

As a 'remedial action' measure (as also noted in § 10.4.1), to help prevent future inadvertent / accidental disconnections of the communications cables, the maintenance service contractor, in conjunction with E911 / Central Dispatch, advised that a hardware modification of the cable connector fittings and connection sockets has been implemented, employing a positive engaging, screw-type, locking feature.

8.0 Medical and Pathological Summary[229, 230]

There were two casualties (fatalities), and seven minor injuries reported in this incident, which are briefly summarized as follows[231].

8.1 Civilian Injuries

8.1.1 Minor / Serious Injuries Reported

The investigation identified that, in consultation with the professional medical staff of the medical facilities utilized in the event, a total of seven civilian individuals presented (self-transported) to those facilities for emergency medical examination and/or treatment, with a complaint that the patient indicated was associated with the event, in which all of the injuries were considered "minor", in which also all of the individuals were subsequently treated and released.

8.1.2 Fatalities[232]

Two civilian fatalities occurred in the event, the circumstances of which are briefly summarized as follows[233].

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[229] information sources: documentation of, and interviews with principals of the emergency services agencies and/or organization(s) referenced.

[230] in this particular investigation, upon the determination by the NTSB investigation staff that it was not necessary to gain access to confidential medical records (i.e. data subject to HIPAA regulations, ref. US Dept. of Health & Human Services / HIPAA regulations; Public Law 104-191, as described in [Internet] http://www.hhs.gov/ocr/hipaa), documentation of the identified emergency services agencies, and/or other organization(s) referenced herein, was sanitized of, and NTSB staff did not gain access to, personally identifiable medical record information.

[231] note - injuries sustained by pipeline equipment recovery / cleanup contractors, or by Hazmat mitigation contractors, if any, are not addressed in this report.

[232] source: documentation of, and interviews with principals of the local Coroner's Office (i.e. Clarke County Coroner), and/or the jurisdictional Medical Examiner (i.e. MS State Medical Examiner's Office). The information cited in quotations are direct quotations from the Coroner's and/or the Medical Examiner's (Death Investigation / pathology) "provisional" (preliminary) report documentation, which is subject to revision pending final pathology report documentation.

[233] for considerations of personal privacy, and in respect to the families / survivors of the fatalities, personal identities of fatalities have been omitted from this report, the information of which remains confidential to the investigation (i.e. accessible only to authorized NTSB staff, or other authorized entities).

1. The body of a 67 y.o. female was located within the perimeter boundaries of a residential dwelling located at 4195 County Road 621, the structure of which was fully consumed (burned to the ground) by fire. The decedent reportedly resided at this address. The body of the decedent, which showed evidence of "advanced thermal burn injuries", was found immediately adjacent to a sleeping bed, in what was believed to be a bedroom area. The Cause of Death was reported to be "Consistent with Smoke Inhalation", with an Underlying Cause of Death reported as [due to a] "Propane Fire".

   Credible witnesses[234] indicated to the investigation that they had been informed by family members of the decedent that this individual likely was somewhat immobile and confined to the residence, due to a pre-existing medical condition[235]. Corroborative to this was evidence of remnants of several small, portable oxygen [O_2] tanks, which were found in the debris of the fire-destroyed ruins of the residence. The decedent was the mother of the other fatality identified in this report section (Decedent # 2, noted below).

2. The body of a 20 y.o. female was located about 13½ feet in front of (i.e. approximately west of) what is believed to be the front entrance of a residential dwelling located at 4207 County Road 621, the structure of which was fully consumed (burned to the ground) by fire. The decedent reportedly resided at this address. The body of the decedent, which showed evidence of burn injuries, was found on the open ground, in what was believed to be a driveway (or a parking) area for vehicles affiliated with the dwelling. The Cause of Death was reported to be [due to] "Smoke Inhalation", with an Underlying Cause of Death reported as [due to a] "Propane Fire". The decedent was the daughter of the other fatality identified in this report section (Decedent # 1, noted above).

The Manner of Death for both fatalities was cited as "Pending Investigation" in the Medical Examiner's report documentation. Medico-legal autopsies were performed on both fatalities, the documentation of which is anticipated to be provided to the investigation when it becomes available.

8.2 Dixie / Enterprise Products - Employee Injuries[236]

None reported.

8.3 Emergency Responder Injuries[237]

None reported.

8.4 Summary Tabulation of Injuries Reported in the Accident

The investigation obtained [sanitized[238]] data, unless noted otherwise[239], from the medical facilities utilized in the incident, and other authoritative sources, identifying the general nature

[234] Command officers of the CVFD
[235] pre-existing medical condition is not disclosed in respect to the family, and for considerations of personal privacy
[236] source: Dixie / Enterprise Products - Party representative.
[237] source: Carmichael Volunteer Fire Department, and Clarke County Sheriff Department - Party representatives

and criteria of reported presenting patient complaints and/or reported injuries sustained in the accident, the collective data of which is summarized in a Tabulation of Injuries Reported in the Accident, in Exhibit 14.

8.5 Injury Criteria Tabulation (49 CFR 830.2)

From the data obtained in the investigation (ref. § 8.4 in this report), a tabulation was compiled, which is based on injury criteria (49 CFR 830.2) of the International Civil Aviation Organization (ICAO), in which also the National Transportation Safety Board uses in accident reports for all transportation modes. The data is compiled from medical / pathological data of persons who were reported as injured in this incident, which is presented in Exhibit 15.

8.6 Medical Facilities Utilized[240]

Three medical facilities were identified to the investigation as having participated, to some degree, in the emergency response to the event, the activities of which are briefly summarized as follows[241].

- The H.C. Watkins Memorial Hospital, located in Quitman, MS [242], which is the only hospital facility in Clarke County, was placed on stand-by alert [243] (i.e. its tactical response personnel) by the hospital administration upon receiving an initial alert of the incident from Clarke County – E911 / Central Dispatch (at about 11:06 [244]), but no patients were documented as transported (by a medical transport vehicle) to this facility for treatment. The investigation identified that three self-transported patients appeared to have been received by the facility with complaints that the patients indicated were associated with the event, in which the injuries to all of the individuals were identified as "minor" in nature, in which also all of the patients were treated and released a short time after they were received.

- The Wayne General Hospital, located in Waynesboro, MS[245], was placed on stand-by alert (i.e. its tactical response personnel)[246] by the hospital administration upon receiving an the

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[238] in this particular investigation, upon the determination by the NTSB investigation staff that it was not necessary to gain access to confidential medical records (i.e. data subject to HIPAA regulations, ref. US Dept. of Health & Human Services / HIPAA regulations; Public Law 104-191, as described in [Internet] http://www.hhs.gov/ocr/hipaa), documentation of the identified emergency services agencies, and/or other organization(s) referenced herein, was sanitized of, and NTSB staff did not gain access to, personally identifiable medical record information.
[239] an exception was one medical facility that declined to provide patient data, as noted in § 8.6.
[240] source: interviews with the administrative principals of the individual medical facilities.
[241] the summarizations cited here are deliberately without personally identifiable information detail, due to considerations of patient privacy (pursuant to US Dept. of Health & Human Services / HIPAA regulations; Public Law 104-191, as described in [Internet] http://www.hhs.gov/ocr/hipaa/).
[242] ref., and for additional information: [Internet] http://www.rushhealthsystems.org/hcwatkins/index.cfm
[243] pursuant to its documented Response Preparedness Plan, which was activated to an 'initial phase', but not further executed, and then deactivated (upon determining no significant quantity of patients were to be received / processed by the facility).
[244] the stand-by alert was independently affirmed by hospital administration in an interview by NTSB staff, although the hospital administrator wasn't able to recall the exact time that the notification was provided.
[245] ref., and for additional information: [Internet] http://www.waynegeneralhospital.org/.

initial alert of the incident (at about 11:15 am [247]), and dispatched an ambulance to the scene, but no patients were documented as transported (by a medical transport vehicle) to this facility for treatment. The investigation identified that three self-transported patients appeared to have been received by the facility with complaints that the patients indicated were associated with the event, in which the injuries to all of the individuals were identified as "minor" in nature, in which also all of the patients were treated and released a short time after they were received.

- The investigation identified[248] that the Jeff Anderson Regional Medical Center, located in Meridian, MS[249], although having no direct emergency response participation the event[250], appears to have received one self-transported patient who presented to the facility with a complaint that the individual indicated was associated with the event, in which the injury to the individual was identified as "minor" in nature, in which also the individual was treated and released a short time later[251].

9.0 Prescribed Regulation / Industrial Standards - Applicable to the Investigation

Pipeline safety for the type of [underground] transmission pipeline, and transported product (liquid propane), involved in the accident, as might be specifically applicable to prospective Survival Factors issues[252], is addressed under the following Regulations and Industrial Standard(s).

9.1 Statutory Regulation of Hazardous Liquids

As developed and promulgated by the Pipeline and Hazardous Materials Safety Administration (PHMSA)[253] / Office of Pipeline Safety (OPS)[254], statutory Regulation[255] under 49 CFR Part

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[246] pursuant to its documented Response Preparedness Plan, which was activated to an 'initial phase', but not further executed, and then deactivated (upon determining no significant quantity of patients were to be received / processed by the facility).
[247] the stand-by alert was independently affirmed by the hospital administration in an interview by NTSB staff.
[248] based upon direct testimony to NTSB staff by the referenced witness / patient, except as noted otherwise.
[249] ref., and for additional information: see [Internet] http://www.jarmc.org/
[250] although this witness presented to this medical facility, this facility is some 40+ miles north of the Carmichael area, and in being such, is far-removed from normal consideration as a primary responding medical facility for such an event, and accordingly (as indicated by administrative principals of the organization), was not alerted to potentially support the emergency response to the event (i.e. activate their Emergency Preparedness Plan, and/or prepare to potentially receive patients).
[251] although this witness to the accident [i.e. this apparent patient] voluntarily provided this information to the investigation (during an interview by NTSB staff), in which also personally identifiable information of the witness is not reported herein [this document], this medical facility declined to provide a confirmation of this information due to what the medical facility indicated was a consideration of HIPAA regulations, in which also, due to the minor nature of the reported injury, NTSB staff elected not to further pursue confirmation from this medical facility, in which also no reason has been observed to challenge the testimony of the witness.
[252] [in pipeline accidents] the Survival Factors investigation exclusively addresses the emergency preparedness and response, and injury causation aspects of the investigation.
[253] as described in [Internet] http://www.phmsa.dot.gov/
[254] as described in [Internet] http://www.phmsa.dot.gov/portal/site/PHMSA/menuitem.ebdc7a8a7e39f2e55cf2031050248a0c/?vgnextoid=ca9fe4fca0380110VgnVCM100000762c7798RCRD&vgnextchannel=8938143389d8c010VgnVCM1000008049a8c0RCRD&vgnextfmt=print

195 prescribes safety standards and reporting requirements for pipeline facilities used in the transportation of hazardous liquids or carbon dioxide. Specific regulation of pipeline safety, as might specifically pertain to the Survival Factors Investigation, is addressed under the following sections of the Part 195 Regulation:

49 CFR 195.402	Procedural manual for operations, maintenance, and emergencies.[256]
49 CFR 195.403	Emergency response training.[257]
49 CFR 195.408	Communications.[258]
49 CFR 195.410	Line Markers.[259]
49 CFR 195.430	Firefighting equipment.[260]
49 CFR 195.440	Public awareness.[261]
49 CFR 195.452	Pipeline integrity management in high consequence areas.[262]

9.2 Industrial Standards

A document, referred to as a Recommended Practice (RP), to provide guidance to be used by petroleum liquids pipeline operators, to develop and actively manage their Public Awareness programs, as required under 49 CFR 195.440 (as noted in § 9.1), was developed, and is promulgated by the American Petroleum Institute (API)[263], as follows.

API - RP 1162 Public Awareness Programs for Pipeline Operators[264]

Although the term "recommended practice" potentially suggests 'voluntary compliance', conformity to this recommended practice is effectively a statutory requirement, pursuant to Final Rule[265] action, issued in May 2005 by the PHMSA-OPS, in which (mandatory) compliance with RP 1162 was "incorporated by reference".

As the topical content of the API - RP 1162 document is a consideration in assessing the comprehensiveness / effectiveness of the Public Awareness Program for the pipeline owner / operator and/or the management service provider (i.e. Dixie Pipeline, and Enterprise Products,

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[255] CFR = Code of Federal Regulations
[256] ref. [Internet] http://edocket.access.gpo.gov/cfr_2007/octqtr/49cfr195.402.htm
[257] ref. [Internet] http://edocket.access.gpo.gov/cfr_2007/octqtr/49cfr195.403.htm
[258] ref. [Internet] http://edocket.access.gpo.gov/cfr_2007/octqtr/49cfr195.408.htm
[259] ref. [Internet] http://edocket.access.gpo.gov/cfr_2007/octqtr/49cfr195.410.htm
[260] ref. [Internet] http://edocket.access.gpo.gov/cfr_2007/octqtr/49cfr195.430.htm
[261] ref. [Internet] http://edocket.access.gpo.gov/cfr_2007/octqtr/49cfr195.440.htm
[262] ref. [Internet] http://edocket.access.gpo.gov/cfr_2007/octqtr/49cfr195.452.htm
[263] as described by the organization, the API is "a national trade association that represents all aspects of America's oil and natural gas industry", as further described in [Internet]) http://www.api.org/
[264] available, as a "non-printable copy", at [Internet] http://committees.api.org/pipeline/standards/docs/1162 nonprintable.pdf
[265] as described in [Internet] http://ops.dot.gov/new/New_2005/Final_Rule_Pipeline_Operator_Public_ Awareness_Plan.pdf

respectively), the subject publication will be subsequently addressed in a separate Addendum to this report (to be available in the public docket).

9.3 Integrity Management Program Requirements

Regulation under 49 CFR 195.452 identifies the requirement for hazardous liquid pipeline operators to develop, implement, and follow a written "integrity management program" for segments of pipeline that are located in "high consequence areas".

Basically described, the concept of a "high consequence area" (HCA) is "… a location that is specially defined in pipeline safety regulations as an area where pipeline releases could have greater consequences to health and safety or the environment. Pipeline safety regulations require a pipeline operator to take specific steps to ensure the integrity of a pipeline for which a release could effect an HCA and, thereby, the protection of the HCA." [266].

As formally defined in 49 CFR Part 195 [267], "*high consequence area*" means:

(1) A *commercially navigable waterway,* which means a waterway where a substantial likelihood of commercial navigation exists;
(2) A *high population area,* which means an urbanized area, as defined and delineated by the Census Bureau, that contains 50,000 or more people and has a population density of at least 1,000 people per square mile;
(3) An *other populated area,* which means a place, as defined and delineated by the Census Bureau, that contains a concentrated population, such as an incorporated or unincorporated city, town, village, or other designated residential or commercial area;
(4) An *unusually sensitive area,* as defined in [49 CFR] §195.6 [268].

Also (as the investigation identified that the event occurred in a 'rural area'), as formally defined [i.e. as applicable to 49 CFR Part 195], "*Rural area"* means "… outside the limits of any incorporated or unincorpated city, town, village, or any other designated residential or commercial area such as a subdivision, a business or shopping center, or community development." [269].

9.4 Compliance with Safety Regulations by Pipeline Owner/Operator and/or Management Service Provider[270]

The investigation queried the PHMSA-OPS, to provide the agency an opportunity to identify what specific inspections, reviews, audits, and/or other validation processes were conducted by the PHMSA-OPS, to demonstrate that Dixie / Enterprise Products was in compliance with, at the time of the accident, certain Federal pipeline safety Regulations that were identified as being

[266] as defined in, and as a direct quote from, Section 1.3.6 of API - RP 1162 (1st Edition, December 2003)
[267] ref. 49 CFR 195.450 Definitions
[268] i.e. [per 49 CFR 195.6] refers to "a drinking water or ecological resource area that is unusually sensitive to environmental damage from a hazardous liquid pipeline release".
[269] ref. 49 CFR 195.2 Definitions
[270] the PHMSA-OPS is responsible for determining if a Pipeline Owner/Operator is compliant with applicable statutory regulation.

relative to prospective Survival Factors issues[271], in which the response from the PHMSA-OPS on these regulatory points was reported as follows[272].

> "PHMSA reviewed Dixie's procedures for emergency response, training, and records of drills conducted. Dixie's procedures require the company to conduct one annual drill per manned facility. Dixie has conducted drills within the Hattiesburg area, internally and with local responders, and provided records (forms DPC0069 and DPC0070) documenting drills from 2006 to 1998. The 2005 [emergency response] drill [conducted] in Petal, MS was documented on records other than Dixie's forms DPC0069 and DPC0070.
>
> PHMSA reviewed Dixie's records for performance of their public awareness program. We had previously reviewed the plan itself and found no non-compliance. Dixie provided records, which showed it had conducted a mail-out of brochures and information per their plan during 2007. This is an annual requirement for emergency responders and excavators and a bi-annual requirement for the affected public. Additionally, Dixie participated in a Pipeline Group Meeting held in Meridian, MS in 2007 for emergency responders. Current information indicates Dixie complied with public awareness requirements.
>
> PHMSA evaluated Dixie's firefighting equipment at Carmichael Station and did not identify any safety concerns. As the fire occurred on the ROW, we [PHMSA staff] did not perform a detailed check of the [Carmichael pumping] station equipment during our accident investigation."

9.5 Accident Report Filed

Pursuant to 49 CFR 195.54 Accident Reports, an Accident Report (Form RSPA F 7000-1), dated Nov. 30, 2007, was filed with the US DOT / PHMSA by the pipeline owner / operator - management service provider, a copy of which is provided in Exhibit 16.

9.6 Statutory Regulation of Other Petroleum Products

The investigation noted that safety for the transport of "natural and other gas by pipeline" is addressed under 49 CFR Part 192 [273].

10.0 Proactively Employed Initiative Measures / Actions - Implemented Subsequent to the Accident [274]

[271] as further described in this report; see § 9.1 through § 9.3.
[272] response cited verbatim, per email to the investigation dated 22 Feb 2008 [with incidental editorial notes and clarifications noted].
[273] ref. [Internet] http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&<?SID>&rgn=div5&view=text&node=49:3.1.1.1.3&idno=49
[274] Information reported in this Section is responsive to an inquiry placed by NTSB staff to the Party representatives (email dated Jan. 30, 2007), where, to the extent possible, the information tendered from the organizations was quoted verbatim, to the extent possible (i.e. allowing for correction of incidental typographical errors, minor truncation editing of detailed / lengthy submissions, terminology definition, etc.).

Solicitations were placed by the Survival Factors investigation, to provide all of the 'Party to the Investigation' participants, as well as other Clarke County Government Agencies which supported the investigation but which were not a formal 'Party to the Investigation' participant, an opportunity for information feedback to the investigation, on specific / documented measures, relative to the Survival Factors investigation, that have been initiated or employed subsequent to the event by these organizations, such to take advantage of 'lessons-learned' in the incident and help disseminate useful information for the benefit of the professional emergency response / emergency services community[275]. The responses received are briefly summarized as follows[276].

10.1 Dixie / Enterprise Products [277]

- Upgrade Emergency Response Action Plans and presentation methods (to the extent possible).
- Work with Carmichael area responders to create a Quick Hit Summary for Emergency Response Action Plans, to carry in their response vehicles.
- Consider creating a Training DVD to be utilized in Emergency Response Action training.
- Emphasize the need for LEL[278] [gas] monitoring in case of response to release with vapor cloud only.
- Recognizing needed safety messages for each stakeholder audience should be slightly different from each other. Dixie's future mail out brochures will be designed and written for each targeted stakeholder audience. For example, the brochure for Emergency Responders will be designed and written with key information they need to know when responding to a pipeline incident, while the brochure for the Affected Public will be designed and written with key information they need to know on recognizing the location of a pipeline, pipeline purpose and reliability, awareness of hazards and prevention measures, damage prevention awareness, one-call requirements, leak recognition and response, where and how to get additional information and the availability of a list of pipelines through the National Pipeline Mapping System. Additionally, the "In an Emergency" telephone number will be prominently displayed on the front [page] of future brochures.
- The "In an Emergency" [800 / Toll-free] telephone number has been emphasized on the Dixie Pipeline [Internet] website Home Page and succeeding sub-pages[279].

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[275] Identification of these initiative measures is not to suggest, in any way, that there were shortcomings in the emergency response, or that any of the cited initiative measures were contributive issues in the emergency response to the incident, but rather, the information provided is to be considered as a *proactive / advocacy effort* by the contributing organizations, where the information will potentially serve as a useful mechanism to foster safety, and as a vehicle for conveying potentially useful information for the public benefit and/or for the benefit of fellow law enforcement / emergency responders, as most organizations retrospectively recognize (upon conducting a review of the emergency response effort) that certain response activities potentially could be done differently, or that new equipment or a revised response process / procedure might be useful in overcoming a previously unrecognized difficulty or deficiency, should a similar situation occur in the future.

[276] cited in no particular priority / sequence order

[277] ref. email from the Dixie / Enterprise Products Party representative, dated 11 Feb 2008, containing correspondence titled "Carmichael Action Plan"

[278] lower explosive limit

[279] ref. [Internet] http://www.dixiepipeline.com/

- Dixie Pipeline is working with other pipeline operators in the state of Mississippi and currently working towards developing a new Mississippi Pipeline Association that will improve and promote pipeline awareness and safety by conducting training sessions with Emergency Responders and Excavators.
- Dixie Pipeline will measure the effectiveness of its Public Awareness program in 2009 by participating in the Public Awareness Program Effectiveness Research Survey (PAPERS), a national industry-sponsored program developed and supported by the American Petroleum Institute (API), Association of Oil Pipelines (AOPL), and the Interstate Natural Gas Association of America (INGAA). This broad, industry-wide approach provides operators with meaningful, comparable, consistent insight on communications efforts that meet the intent of the RP 1162 regulatory requirements.

10.2 Carmichael Volunteer Fire Department[280]

- CVFD is working with Clarke County to improve communications.
  - discussions in progress on possible installation of a radio signal transmission / receiver tower in the area of the Carmichael fire station.
- CVFD in the process of applying for Grant funding to purchase a [fire department] Tanker Truck with AFFF [fire suppression foam] capabilities for oil fires, vehicle fires, etc. Such a capability would not help for a 'propane fire', but the CVFD has seen a great need for extra water for secondary fires, very large fires, and also to haul potable [drinking] water, which was a need after Hurricane Katrina.
- CVFD, in working with the Clarke County Sheriff Department, and in conjunction with support from the Clarke County Board of Supervisors, has successfully implemented issuance of suitable identification credentials ("ID badges") for CVFD personnel [firefighters] responding to emergencies, to allow them unimpeded access through traffic control roadblocks, which would also be useful to Incident Command in facilitating on-scene emergency response personnel accountability[281].
- CVFD is working with Clarke County to have GPS[282] navigation capabilities on the next [purchased] CVFD [pumper] fire truck.
- CVFD is working with Dixie / Enterprise Products [the pipeline owner - operator / management service provider] to obtain, and looks forward to receipt of, hand-held gas detection meter equipment, for use by the CVFD in responding to potential [propane] product release emergencies.

[280] ref. fax transmission from the Assistant Chief of the CVFD (sent on behalf of the Chief of the CVFD), dated 11 Feb 2008, and subsequent correspondence.
[281] 'on-scene accountability' an administrative mechanism [tool] available to Incident Command, whereby certain emergency response field personnel, while performing 'relatively high-risk' on-scene duties (e.g. fire suppression, hazardous materials response, rescue efforts, etc.), are 'actively tracked' (on a 'tracking board', or by similar method) in order to be able to promptly identify where an individual is physically located at any given moment, to help assure that the individual is not inadvertently placed at an 'elevated level' of risk while performing 'relatively high-risk' on-scene duties.
[282] global positioning satellite

- CVFD is working with Clarke County to acquire high-visibility [safety] vests for on-scene emergency personnel.
- CVFD is working with PHSMA to acquire County map(s) showing specific locations of pipelines, for placement in the CVFD fire station, such to be available as a ready-reference information source (e.g. showing diameter, contents, pipeline company name) during an adverse incident involving a pipeline.
- CVFD has conversed with Dixie / Enterprise Products on possibly acquiring instructional training materials (DVD's, emergency response procedural manuals, etc.), and possibly conducting hands-on emergency response training with the CVFD.
- CVFD, in concert with all of the responding emergency services organizations (i.e. mutual aid fire / rescue, ambulance, law enforcement, etc.), held an informative Critique [Incident Debriefing] Session with Dixie / Enterprise Products representatives.
- CVFD will be discussing with Dixie / Enterprise Products about having Dixie / Enterprise Products field personnel who respond to adverse incident(s) involving the pipeline, being trained to make on-scene command decisions, or for the responding field personnel to have the ability to expeditiously communicate with Dixie / Enterprise Products principals who are capable of making command decisions.
- CVFD is applying for Grant funding to purchase new 'turnout gear' [firefighter protective clothing / equipment], and a Cascade [breathing air storage] system to refill SCBA cylinders ["air bottles"][283].

10.3 Clarke County Sheriff Department[284]

- In conjunction with Clarke County Emergency Management, the next revision of "Clarke County Comprehensive Emergency Management Plan" to include, or to address (to the extent possible):
  - a better balance of the roles of law enforcement vs. fire / rescue resources at an incident response,
  - add a 'decision tree' process to help determine if the Incident Command process should be focused principally as a 'crime scene' [law enforcement] response vs. an 'accident scene' [fire / rescue] response,
  - seek a more participative role for responding pipeline [tactical response] personnel who have the ability to make command decisions (on behalf of the pipeline company) in the field,
  - further site-specific information detail to be included in the Plan,
  - recognition / employment of forensic evidence preservation / security measures (irrespective if a law enforcement, or a fire / rescue type of incident response), such to facilitate later potential evidence documentation / recovery efforts by investigators.
- Clarke County Sheriff Department, in conjunction with support from the Clarke County Board of Supervisors, helped in the implementation of issuing suitable identification

[283] exemplar as described by a vendor of such equipment: [Internet] http://www.americanairworks.com/cas-dot.html
[284] ref. email transmission to Clarke County Sheriff, dated 12 Feb. 2008, and subsequent telephone discussions.

credentials ("ID badges") to CVFD personnel for responding to emergencies, to allow them unimpeded access through traffic control roadblocks, which would also be useful to Incident Command in facilitating 'on-scene accountability [of emergency response personnel][285], in which also issuance of identification credentials was expanded to all of the fire / rescue departments in Clarke County.

- Explore acquiring visibility enhancement equipment (high-visibility vests) for on-scene emergency services personnel in Clarke County.
- Conduct more hands-on training drills with pipeline operators, with more descriptive literature on pipeline emergency response procedures.
- Obtain current Clarke County map(s) from pipeline operators, with possible PHSMA support, showing specific locations of pipelines, with the maps to be strategically placed in the jurisdictional fire / rescue stations, law enforcement offices, emergency communication [fire and police radio] offices, etc., such to be available as a ready-reference information source (e.g. showing diameter, contents, pipeline company name, etc.) during an adverse incident involving a pipeline.
- Endeavor to continuously improve inter-organization communications wherever possible.
- During press briefings (principally needed only at major incidents), Incident Command will endeavor to present the recognized facts, as available at that time, in a manner that more easily allows a revision of the facts as they become available.
- Law enforcement to better facilitate / execute pipeline right-of-way encroachment efforts*.

*as a reiteration, and to help avoid confusion, this particular initiative activity has no direct bearing on the accident (i.e. there was no right-of-way encroachment that resulted in the pipeline rupture), in which also this initiative line-item is included as one element of the overall scope of initiative activities to be potentially employed, in the interest of promoting public safety, by the Clarke County Sheriff Department involving pipeline safety.

10.4 Other Clarke County Government Agencies[286, 287]

10.4.1 Clarke County Communications – E911 / Central Dispatch

- will endeavor to better coordinate with the maintenance contractor of the Fire Department Service Radio – Signal Repeater System, to help prevent inadvertent / unanticipated / unscheduled equipment [apparent] malfunctions or shutdown(s)[288].

[285] 'on-scene accountability' an administrative mechanism [tool] available to Incident Command, whereby certain emergency response field personnel, while performing 'relatively high-risk' on-scene duties (e.g. fire suppression, hazardous materials response, rescue efforts, etc.), are 'actively tracked' (on a 'tracking board', or by similar method) in order to be able to promptly identify where an individual is physically located at any given moment, to help assure that the individual is not inadvertently placed at an 'elevated level' of risk while performing 'relatively high-risk' on-scene duties.
[286] i.e. other Clarke County Government Agencies which supported the investigation, but which were not a formal 'Party to the Investigation' participant.
[287] ref. on-scene, and subsequent discussions with the Clarke County Communications Center Director, and a Member of the Clarke County Board of Supervisors.
[288] as further described in this report; see § 7.3.1, and § 7.9.

- is now conducting bi-weekly tests of the emergency response [fire / rescue] dispatch Pager [notification] System, the help validate that the Service Radio - Signal Repeater System is performing normally [288].
- is now including an action-item in their procedural routine for the periodic validation that the Communication System time clock corresponds with the 'USNO Master Clock' Time Standard[289].
- operating personnel attended the "Government Liaison - Emergency Response Program" emergency responder familiarization event held in April 2008, in Meridian, MS.
- as a 'remedial action' measure[290], to help prevent future inadvertent / accidental disconnections of the communications cables, in conjunction with the technical maintenance service contractor[291], this agency implemented a hardware modification (of the cable connector fittings and connection sockets) that employ a positive engaging, screw-type, locking feature.

10.4.2 Clarke County Emergency Management[292]

- In conjunction with Clarke County Sheriff Department, the next revision of "Clarke County Comprehensive Emergency Management Plan" to include, or to address (to the extent possible):
  - a better balance of the roles of law enforcement vs. fire / rescue resources at an incident response,
  - add a 'decision tree' process to help determine if the Incident Command process should be focused principally as a 'crime scene' [law enforcement] response vs. an 'accident scene' [fire / rescue] response,
  - seek a more participative role for responding pipeline [tactical response] personnel who have the ability to make command decisions (on behalf of the pipeline company) in the field,
  - further site-specific information detail to be included in the Plan,
  - recognition / employment of forensic evidence preservation / security measures (irrespective if a law enforcement, or a fire / rescue type of incident response), such to facilitate later potential evidence documentation / recovery efforts by investigators.

-- End of this Report Section --

[289] as further described in this report; see § 6.8.3.
[290] as further described in this report; see § 7.3.1, and § 7.9.
[291] Comsouth, Inc., 1712 Highway 19 N., Meridian, MS 39307
[292] as further described in this report; see § 6.3.1